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ABSTRACT

This instructor's guide was used to help instructors present a course in test-taking skills and five areas that are tested in a standardized test used for apprenticeship screening at many manufacturing companies. The course description lists target audience, general objective, and typical results observed. The rationale for the whole language approach is presented. The next section gives instructors basic information related to providing successful educational programs in a workplace setting, an instructor's lexicon of strategies and principles that can be used in teaching, instructor's role and responsibilities, and course objectives. An explanation of lesson format lists six parts of the template used to design the lessons--understanding/outcome, materials, demonstration, exercise/engagement, workplace application, and evaluation/comments. A sample template and explanation of each part follows. A section on planning and scheduling deals with time requirements, class size, expected outcomes, prerequisites, and suggested timing for each lesson. Lessons are organized into the following categories: verbal reasoning, numerical reasoning, abstract reasoning, mechanical reasoning, space relations, test-taking, and optional lessons. (Contains 12 references and a glossary of 68 terms.) (KC)

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ED 424 382

WORKPLACE EDUCATION

Apprenticeship Preparation

Instructor's Guide

(Revised edition for publication)

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Mary Jarvis
Irene Sinclair

Project ALERT

CE077292

Wayne State University
College of Education

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Overview of Apprenticeship-Preparation

Description: This course covers test taking skills and five areas that are tested in a standardized test (Differential Aptitude Tests) used for apprenticeship screening at many manufacturing companies. The areas are:

Verbal Reasoning
- Define analogies
- Fill in missing parts of analogies

Numerical Reasoning
- Perform 4 math operations
- Find divisible numbers
- Round off numbers
- Use fractions in all operations
- Find % of a whole
- Find the whole when a % is given
- Use flowchart to follow directions
- Find the value of an unknown whole number or fraction in 4 basic operations
- Substitute the value of "y" in an equation
- Solve problems using the order of operations

Mechanical Reasoning
- Interpret mechanical effects using simple diagrams
- Interpret laws of physics using simple diagrams

Abstract Reasoning
- Determine the sequence of patterns

Space Relations
- Visualize a 3-dimensional figure from a 1-dimensional pattern

Test taking Skills
- Recognize objective test format
- Plan time wisely
- Manage test anxiety
- Overcoming negative attitudes
- Tips for better test results

Length of Time: This course is designed to be delivered in 36 hours over 12 weeks.

Target Audience: Employees at manufacturing companies with basic reading and math skills. Reading and math improvement is taught, but basic literacy and numeracy is assumed.

General Objective: Participants in this class will refresh and improve a variety of skills and be able to successfully complete tests, especially the DAT (Differential Aptitude Test), used for apprenticeship screening.

Typical results observed: Out of 24 people who completed the initial class, 23 improved post-test scores.

Comments: *Union Plant Chair:* "Everyone who went was very happy with what they received and with the results."
Human Resource Director: "This was a good experience for everyone."

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Rationale for Curriculum Approach

The Whole Language philosophy provides the best approach for developing the learner. It supports success in the classroom and on the job. The integration of the curriculum reinforces all of the skills required to improve job opportunities. The key to providing a successful Whole Language program is assuring that every learner will be recognized as a potentially successful student. The learners must be co-partners in this collaborative effort. Learners are an integral part of the learning situation. They are valued for what they bring to the learning experience. The instructor is regarded as a facilitator of learning rather than the major source of knowledge and information.

Recognizing and building upon their unique past experience is crucial for integrating new learning. In this process, continual dialogue and interaction are key to the instructional process. The curriculum is built on the learners' strengths, not weaknesses, and accommodates the variety of learning styles and cultural orientations. It also encourages the learner to assume responsibility for his/her own learning. Recognition of success in the classroom enables learners to feel good about themselves. Learners become empowered workers by understanding the job process and how they contribute to the big picture.

Overall, raising the learners' level of self-awareness on the job, in the home, and in the community, will create a more satisfied and productive member of the work force.

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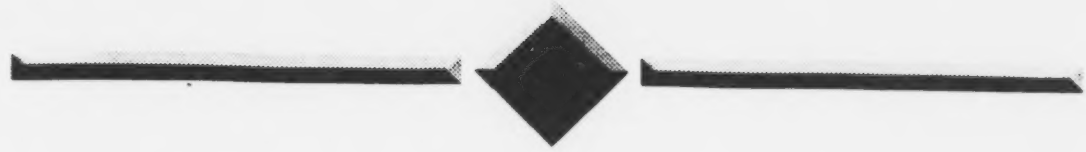
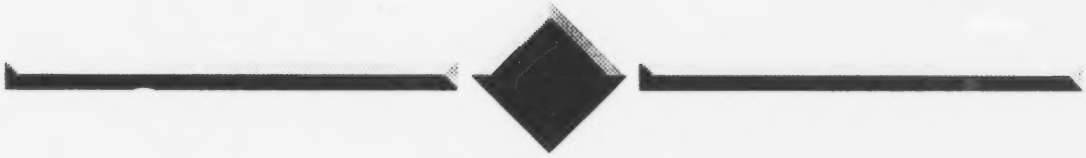


Making it Work



This section of materials is provided to give instructors basic information related to providing successful educational programs in a workplace setting.

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Adult learners

General characteristics of adult learners:

1. Purposeful learning occurs with adults experience a problem or recognize a gap between where they are and where they want to be, then start to draw on resources to acquire the learning they consider necessary to close the gap.

2. One of the most important issues to consider from the adult learner point of view is "What's in it for me?" An adult needs to know that there is real value in what is being taught. Customize and adapt lessons to suit your students. Make a regular effort to point out what benefit the instruction has for the student. Many times students are unaware of the applications of learning. Make sure you point out possible applications of knowledge.

3. Adult learners insist that learning have relevance and value now, contrasted to youthful learners whose education is largely subject-centered and future-oriented. Most adults are already busy with their jobs and families, so the learning must be worthwhile.

4. Adult learners will drop out of educational situations that are seen as not accomplishing their own agenda.

5. The central organizing principle for adult learning must be around finding solutions for problems adults face. Emphasis must be on helping adults learn to cope with problems they face. Therefore, the instructor must be more *person*-centered than subject-centered.

6. Adult learners are well aware of what they need to know, and they like to participate actively in all phases of their education--assessment, instruction, and evaluation.

7. Many adult learners come into programs with the "baggage" based on a history of negative educational experiences. It is absolutely essential to provide a safe, non-threatening atmosphere where risks can be taken with out fear of humiliation or embarrassment.

Environment

Creating a safe environment for learning is a key factor in success. One of the elements that is part of a safe environment is multicultural sensitivity. The following suggestions should be considered as the lessons are delivered:

1. Use multiple instructional strategies to accommodate all learning styles. See *Learning Styles* for more information on this topic. Also see *Teaching Auditory Learners, Teaching Kinesthetic Learners; Teaching Visual Learners.*

2. Avoid ethnocentrism (belief in the superiority of one's own ethnic group), use of stereotypes, critical or judgmental attitudes, fear, and rigid expectations. Strive to

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address the various cultures represented in the group. Try the AAAA approach to Cultural Diversity: Awareness; Acceptance/Appreciation; Action

3. Seek to understand the unique motivations of your audience in the workplace. Each worksite has a particular culture. It is important that you strive to understand and become a part of that unique culture.

4. Use materials that are not slanted toward any particular group.

Above all, the instructor must establish a learning environment in which diversity is valued. Students need to feel that their cultural backgrounds are viewed as assets to the class.

Teaching Auditory Learners

(Adapted from materials from presentation, *Designing Workplace Training to Accommodate Culturally Diverse Learners*, Douglas Jones, Linda Mrowicki, Workplace Education Division of THE CENTER-RESOURCES FOR EDUCATION, delivered Jan. 1996.)

Auditory learners learn best by listening to others. They usually do well in a "traditional" classroom.

Audio tapes: Have students or groups listen to a tape or create their own tapes for each other to listen to.

Music: Record key points on an audio cassette with background music. Write a song, rap, jingle or rhyme about the learning material.

Guest speakers: Invite subject matter experts to talk about a topic. This can be outsiders or members of the class.

Reading: Read or tell a story, for variety use music in the background.

Discussions: Use questions to get others in the class involved. Not only can students learn from the instructor, but they can learn by listening to each other, and the instructor can learn from listening to the students.

Repetitions: Repeat things out loud.

Directions: When giving directions, be sure to give them orally.

Mnemonic devices: Mnemonics are artificial aids to memory. The keyword HOMES can be used to remember the names of the Great Lakes; H = Huron O = Ontario M = Michigan E = Erie S = Superior. Sentences and rhymes can also be used; to remember which direction to turn a screw to tighten = Leftie Loosie, Rightie Tightie. Steps in basic division can be incorporated into the sentence: Donald (or Donna) made some candy bars = D = divide M = multiply S = subtract C = compare B = bring down.

Be the Instructor: Pair the class and have one individual teach the other, then reverse roles.

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Concept Review: The instructor uses transparencies, pictures, charts, etc. that were used in presenting the lesson as a means of review. While playing soft music, the instructor displays and reads the instructional materials. A variation is to have a willing student read the instructional materials.

Oral Cloze: Use oral cloze (fill in the blank) activities to repeat key information

Teaching Kinesthetic Learners

(Adapted from materials from presentation, *Designing Workplace Training to Accommodate Culturally Diverse Learners.* Douglas Jones, Linda Mrowicki, Workplace Education Division of THE CENTER-RESOURCES FOR EDUCATION, delivered Jan. 1996.)

Kinesthetic learners learn best by doing. They like to be physically expressive. They also need to stretch and move periodically. The following are activities that enhance kinesthetic learning.

Walking and studying: Allow students to walk while they study.

Role playing: Use props and costumes while role playing. Can be done with a group or in pairs.

Action learning: Includes anything that requires people to use their bodies in some way while they learn. It could be a song, a dance, a mime, a physical acting out of a technology or process, or an active performance of the learning material where learners become interacting components of the material they are learning.

Strolling review: Have the group prepare colorful flip charts as a means of review. Hang them around the room. Play music softly as individuals walk silently around the room, carefully observing the wall display or examining the mind maps created by other learners. A variation is to play music while individuals stroll around and review.

Being the Coach: Ask one partner to be the coach while the other partner learns to perform a new task. After one run, reverse roles.

Demonstrating: Allow class members to demonstrate and physically do an activity. Provide opportunities for practice using repeated motion.

Writing: Writing requires students to use parts of their bodies. Write on surfaces with a finger. Write in the air. Trace on sandpaper. Take notes. Write lists.

Sequencing: Using a topic that has several steps or procedures, give each individual a piece of paper with the words or a graphic depicting one step or procedure. Ask the group to move around until they are in the correct sequence. An option is to act out what is on their piece of paper.

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Teaching Visual Learners

(Adapted from materials from presentation, *Designing Workplace Training to Accommodate Culturally Diverse Learners*, Douglas Jones, Linda Mrowicki, Workplace Education Division of THE CENTER-RESOURCES FOR EDUCATION, delivered Jan. 1996.)

Visual learners like to process, store, and retrieve information visually. The following are examples of activities that instructors can use to facilitate the visual learner.

Demonstrations and modeling: Since visual learners like to understand the "big picture," it is important to show or model all of what is expected before breaking it into its components.

Draw: Simple illustrations can be used to reinforce important information. Encourage students to draw as a means of committing key information to memory.

Imagery: Imagery is the mental visualization of objects, events, and arrays. The typical technique is to ask students to form a mental picture. It usually works best for concrete information and less well for abstract information. Images are better remembered if they are vivid and show some type of movement.

Study Guides: Study guides are used to summarize key information. They are useful for reviewing key points. Instructors can create study guides, or better yet, allow students or groups of students to prepare a study guide.

Graphic organizers: These are visual tools which can show the relationship of categories of information. Charts, graphs, and maps can be used to show relationships visually. They are also good because they usually show or explain a concept holistically. Instructors can create blank charts or matrices for the learner to complete.

Mental Imagery: Have learners rehearse or practice a knowledge base or a skill in their minds.

Mind mapping: Ask individuals to mind map a lecture or presentation, a written lesson, an article, an audio tape, a recollection, an experience, or anything relative to the learning situation that might be significant.

Note taking: Encourage visual learners to take notes using words or pictures. This provides them with another opportunity to visually rehearse the information. Note taking can also be done using a map which allows them to see the "big picture."

Create notebooks: Using notebooks for class projects provides another way for students to see the information in their own words. It allows them to "customize" the information and make it their own.

Color codes: Visual learners like to see different things/views. Use color as a means of focusing attention, or use it as a means of changing the environment to add interest visually.

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Study cards: Study cards use the visual sense to present the information. They can be used individually, with partners, or in large groups. Cards can be prepared by the instructor or students can prepare their own.

Pictures: Watch TV, filmstrips, movies, videos, etc. Another option is to have the group create their own video.

Mnemonics: Create acronyms, draw visual chains, or develop acrostics.

Directions: When giving directions, give them visually.

Tips on Teaching

1. Use logical sequences. Avoid jumping into topics without developing background or relevance for the skill at hand.
2. Control length of lessons into manageable chunks. Many employees come into classes at the end of a long and tiring day. Pace lessons so students can have short breaks.
3. Give recognition and encouragement. It is vial that you recognize and encourage all your students' progress toward their individual goals. Unfortunately, often adult learners are not supported by friends and family who view time spent in class as time taken away from them.
4. Use coaching. Model new skills. Point out the problems or pitfalls many students have with lessons. Repeat explanations several times or a period of time and several ways to accommodate all learning styles. Be there for them.
5. Encourage involvement. Make sure students hear you validate how important it is to learn new skills. Techniques that make provisions for active involvement of students will achieve learning faster than more passive teaching techniques.
6. Give feedback. Adults need to be reassured that they are on track. Give feedback often, and be sure to give negative feedback along with something positive.
7. Use summaries and advance organizers. When materials are detailed or involved, help students see the "big picture."
8. Questions will help you assess how your students are understanding. Make sure they are not accusatory in tone. It is possible to inadvertently press a "hot button" based on a students' unpleasant school memories. Maintain a safe atmosphere for students when questioning them.
    - Direct questions are usually *yes* or *no*, or short answer. They are easy to control.
    - Open-ended questions are more likely to prompt discussion. They are not as easy to control.

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Instructor's Lexicon

The following lexicon is provided to remind teachers that there are a variety of strategies and principles that can be employed in teaching. When you are not getting the response you expect, when faces are blank or bored, when attendance starts to slip--*try something else*.

Anticipation Guides (Readance, Bean, and Baldwin) Prepare students for reading by asking students to reach to a series of statements prepared by the teacher in advance. Expected response is TRUE or FALSE.

Application of concepts to different situations- learning that is applied immediately is retained longer and is more likely to be used immediately than that which is not. Techniques must be employed that encourage the immediate application of any material in a practical way.

Application to individual situation --Provide real life or real work scenarios for which students read different texts to solve problems

Article/pictures

5 W's (Who, What, When, Where, Why/How)
Antonyms/Synonyms
Match or rewrite topics/headlines
Change time, place, people and rewrite
Write questions with higher levels of critical thinking

Brainstorming--All responses are accepted, no judgment. Activates background knowledge. Gets students thinking before they read or write.

Cartoons- students fill in blank balloon with appropriate response

Categorical Overview-- Write down associations , think how they are related, categorize information, and label.

Cloze– It is a method of systematically deleting words from a prose selection and then evaluating the success a reader has in accurately supplying the words deleted. In a given passage the first and last sentence is provided in tact. Thereafter selected deletions are made. *Ex.* Every 5th or 10th word; Initial/final letter; Word/ phrase; All nouns or verbs, etc.

Clustering-- Similar to mapping, adds visual dimension to the process of organizing ideas, helps students separate ideas into categories. Improves organization of thoughts for speaking or writing.

Coded Vocabulary--Student marks words that he knows with an asterisk, check mark for words he has heard of, and circles the words that he does not know.

Compare and contrast–Write or discuss similarities (compare) and differences (contrast)

Concrete Items/Demonstrations-- Including actual items in classes helps those learners who need more tactile or kinesthetic learning experiences understand. Visual and audio learners have an easier time with traditional formats than other kinds of learners.

Continuum of Descriptors--Write adjectives on a line to show degrees of modification, such as minuscule, tiny, small, average, big, huge, enormous

Cued Retelling (See article on Retelling--Free and Cued)

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Cubing--On a paper cube, write down one of the following words on each side of the cube: describe, compare, associate, analyze, apply, argue for. When writing or discussing an object/concept, have students write about it using the suggestions from each side of the cube.

Designated Roles (Cooperative learning)

Listeners note points of disagreement
" " what is not said
" " questions to ask

DRAT (Directed Reading/Thinking Activity-Haggard, 1985)

Activate prior knowledge
Predict what will be covered
Read to designated point
Confirm, revise, or elaborate prediction with information from text
Continue in similar fashion through text.

Dyads confirm/explain
make decisions
draw conclusions

Find someone who . . . --an ice breaker activity to raise awareness of the depth of experience and diversity in the class. Typically you can only get another person to sign your sheet once. Categories can be as generic as "find someone who has more than 5 brothers and sisters" or "find someone who speaks another language" to class specific information like "find someone who has read a the work of Edgar Allan Poe." It can be designed for many topics but always helps students get comfortable with each other.

Flash card directions--Challenge learners to read more than one word at a time by giving direction quickly on flash cards. Ex. Put your hands on the table.

Free-writing/thinking

Can you think of a time . . .
Questions regarding topic

GIST--requires readers to reduce the first sentence of a passage to 3 or 4 words. The next two sentences to 5 or 6 words. The next three sentence to 7 or 8 words. This requires readers to make meaning and determine their own key words.

INSERT (Interactive Notation System for Effective Reading)--Students place a √, X, +, !, ?, ?? and * besides ideas they read to indicate whether they understand it (√), are excited about it (X), don't understand it (?) , are stumped by it (??), or want to remember it (*).

Interviewing--Encourage students to generate a list of questions that would give them the information they would like to find out about someone. Have students break into pairs and interview their partner, using questions. Then let each introduce his/her partner using the information obtained.

Jigsaw/segmented reading --Instructor assigns parts of a selection to different readers. Readers read their part silently. Each reader shares what they read with group.

Journals--Students write reaction to class, write comments, write questions. Instructor does not judge them on technical competencies. May be used to tie topic of class to learner. If topic is American Education, journal writing questions could be: Where did you go to school? What did you like best in school? What irritated you the most? Why did it irritate you? Who was your favorite teacher? Why did you come to this class?

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Key word predicting activity--Instructor selects passage and notes 10 key words. Words are shared with learners who are asked to predict content. Learners should try to make sense of key words. Next, learners read passage and find out if predictions are on target.

K-W-L--(Ogle, 1986) Students identify what they **K**now about a topic , what they **W**ant to find out about a topic, and what they **L**earned about the topic.

LEA (Language Experience Approach, Stauffer, 1970) Students dictate sentences about an experience as instructor transcribes. This text become the reading material for that student.

Learning style--The 3 major learning modalities:

Visual-needs to see material
Auditory-needs to hear material
Kinesthetic- needs to move around while learning

LINK-- L= List I= Inquire N=Note K=Know List all associations for concept/topic on overhead/chart; inquire - give examples, clarifications about associations; note - write what comes to mind for one minute (overhead off/chart covered); know - what I know now about this concept/topic?

List and skip– instead of looking up words as you read, use a *List and Skip* bookmark. Write down unfamiliar words from reading selection. After completing selection, look to see if any words were understood through use of context.

Main Idea-- explanation overheard by instructor between students. "How would you tell your mama what the (article, book, chapter) was about if you were calling her long distance?

Mapping (Baumann, 1991)--Arranging key terms into a diagram that is meaningful to the student. It can include the following:

Key words/phrases
Structure
Questions
Connecting lines/circles

Is a graphic representation of the relationship between major ideas and supporting details.

Metacognition - Being aware of how you learn, and the process of thinking through a learning situation. The development of self-questioning or monitoring of patterns of thinking, which helps students become an independent learners who can recognize and correct their processing errors.

Questions with others

What do you think about . . .?
Why is . . . used for . . .?
What would you do if . . .?

Paired Questioning --Divide students into pairs, read passage, close book. Each in turn asks questions with the other answering; tells important ideas; paraphrases or summarizes; agrees/disagrees; draw picture or graphic representation of what learned.

Reading strategies– Good readers bring what they know about the topic to the print on the page. They are active readers. Good readers take chances, they risk being wrong. Good readers guess at or skip words they don't know and read on for help. Good readers

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expect the material to make sense. Good readers try to match reading speed to what they are reading.

Reading techniques

see: Flash card directions
see: GIST
see: Key word predicting activity
see: List and Skip
see: Word Bank

Reciprocal questioning

Students work in pairs
Both read a portion of a reading selection.
One asks the other a question.
Continue reading selection
Alternate asking questions.

Retelling/rewriting- Can be free retellings, cued retellings, and/or cued comprehension questions. Provides an opportunity for students to reflect and revise their thoughts. Teachers can record students thoughts without having to infer right or wrong choices. Possible prompts: *Write down everything you can remember about the selection you just read.* Provide a list of words from the passage, and then, *Use these words to help you remember everything you can about the passage. See Retelling--Free and Cued*

Retelling--Free and Cued - A free retelling allows a reader to structure his or her demonstration of comprehension without the constraints often imposed by a testing situation. If the objective of the assessment is to find out how the student is thinking about the content rather than how much he can demonstrate that he knows, the unprobed (free) retelling is probably the best response.

Researchers find the free written retelling to be an invaluable tool as they explore issues related to reading comprehension. Retellings allow analysis of the link between the response and the original source (the text). Many teachers are reluctant to use them because they do not lend themselves easily to objective scoring.

Since remembering and understanding are not synonymous, there is value to using retrieval cues as an aid to comprehension. By including word or phrase cues the reader has the freedom to indicate his or her comprehension according to personal dictates while simultaneously providing bits of text to help dissolve the confusion between what is understood and what is remembered. **Cued retellings** may be the best of both worlds.

In order to do this form of assessment, the teacher needs to have comprehension questions in mind. the perspectives on comprehension that are to be checked should be noted.

Were the students responses text explicit (Just the facts recited)
Were the responses full of nonessential details? (Not important to understanding the essential message of the passage)
Does the student understand the essence of the passage? (Main idea)

Unless you assess students' comprehension with the intent to learn what students do and do not remember, you can only speculate about their comprehension and the appropriateness of your instructional focus.

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Say Something- 2 students read a passage to a designated point Each has to say something about the reading

Segmented reading --see: Jigsaw

Semantic map--see Mapping and Webbing

Sequencing--*Paragraphs*

- Articles are cut into parts based on content.
- Student reads each part
- Student orders the parts based on content

Pictures

- Cartoons or picture sequences are cut apart
- Student orders the part based on content

T Chart -- (Johnson & Johnson)Write the name of a skill to be learned or practiced and draw a large T beneath it. Write "looks like" on the left side of the T and "sounds like" on the right side. On the left side list behaviors that one might see in someone exhibiting this skill. On the right side list phrases that might be used by someone exhibiting this skill.

Think aloud- (Davey)Instructor models and tells the thought process for an instructional piece of material.

Three-way rotation--Three different ways of saying the same thing.

Time line-- Events are placed on a time line to visualize the relationship of events in respect to what else was happening at the same time.

Total Physical Response (Asher)--incorporates listening to directions or commands like, "STAND UP!, SIT DOWN!" and they respond to commands without speaking. Used most effectively in early ESL situations.

Transformation- charts, graphs, maps, forms -learn key idea and transform into different format/media Ex. Act out without words Make a chart or form to explain information to others

Webbing-- Similar to semantic mapping - as a graphic representation of the relationships between major Supporting details are then supplied for the secondary ideas in a logical fashion.

Word bank--a versatile tool for vocabulary learning. Excellent warm up before reading and writing, assessing prior knowledge. Select a topic related to reading. "When I think of _____ I think of _____" Instructor fills in blanks then asks, "What do you think of? Try to generate 25-50 words per topic.

a. Builds critical thinking skills by clustering words that belong together.
b. Try adding prefixes and suffixes. Discuss how changing the form can change meaning.
c. Focus on spelling; note roots and affixes, number of syllables.
d. Plan a writing exercise. Determine organization according to purpose.
   How to = chronology
   Personal experience = narrative
   Description = topic characteristics.
e. Add vocabulary words as they are discovered through reading or conversation

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Instructor's Role and Responsibilities

There are four main responsibilities in your role as instructor of this class.

1. **Instruction** -- As the instructor you will choose the lessons and gauge the depth of instruction based on the needs of your students and the accomplishment of the objectives.

2. **Assessment** -- This vital part of your role should be handled with great sensitivity. Many adults have not been in a classroom setting for a long time. For some, the testing situation and facing the results of tests is an extremely stressful experience that can cause them to drop out of the class. Diffusing the anxiety of the testing situation is a necessary part of your role.

The pretest (Preview) should be giving before instruction begins to gauge the level of your students' understanding and prior knowledge of course content. The posttest (Review) should be given at the end of instruction. Results will be compared to see if instruction made a difference.

Also, the pre and posttests are identical, with the exception of the cover page. Make sure the pretest uses the *Preview* cover page and the posttest uses the *Review* cover page. The subsequent pages are identical.

3. **Keeping attendance records** -- In some work situations, attendance is mandatory. In others, employees are paid to attend and accurate attendance records should be maintained.

4. **Other records** -- Anecdotal comments and observations, especially in regard to learning or change, should be documented. Companies and unions are very interested in this kind of feedback and may want to use quotes from participants for recruitment or promotional activities.

This lesson format encourages you to keep notes on how individual lessons worked and what changes might be made to make the lesson more effective to your particular situation.

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Objectives

The main objective for this course is to improve skills tested on apprenticeship screening tests. (This course was based on preparation for the Differential Aptitude Tests -- DAT) The following areas are specifically addressed:

1. ***Improving verbal reasoning skills based on completing analogies***

- Define analogies
- Fill in the missing parts of analogies

2. ***Improve numerical reasoning skills***

- Perform 4 basic operations (addition, subtraction, multiplication, division)
- Place value
- Round off numbers
- Use fractions in all operations
- Use decimals in all operations
- Find percent of a whole
- Find whole when a percent is given
- Use a flowchart to follow directions
- Find the value of an unknown whole number in basic operations with whole numbers and fractions
- Solve problems using the order of operations

3. ***Improve abstract reasoning skills***

4. ***Improve skills related to space relations***

5. ***Improve mechanical reasoning skills***

- Machines 2
- Gears, pulleys, and braces
- Directional effect
- Gravity

6. ***Improve test-taking skills for successful preparation***

- Overcoming negative attitudes
- Strategies for dealing with test anxiety
- Understanding question formats
- Tips for better results

How these lessons are organized

Objectives for each course have been identified. Lessons have been designed to assure objectives are accomplished. Lessons are designed with a template that has six parts:

I. Understanding/Outcome

II. Materials

III. Demonstration

IV. Exercise / Engagement

V. Workplace Application

VI. Evaluation / Comments

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A sample template and explanation of each part follow

Explanation of Lesson Format

I. Understanding /Outcome: Focus of the lesson.

Materials: What is needed and helpful to do the lesson. Accompanying supplementary materials: Materials supplied or designed to support the lesson.

III. Demonstration	
Activate prior knowledge. The activation of prior knowledge is a critical piece of the Whole Language philosophy. Lessons will always begin with suggestions for activation of prior knowledge, so students can make a connection to their past experience.	Suggested activities. Examples of possible scenarios or questions to initiate discussions. See *Instructor's Lexicon* for an explanation of possible methods.

IV. Exercise/Engagement:	
A step by step procedure for the lesson. Specific activities to engage the students with instructor supervision. The instructor is provided with this framework with the understanding that adaptations may be made to suit the individual or the group.	1. Suggested activities. See *Instructor's Lexicon* to familiarize yourself with the variety of strategies that can be used..

V. Workplace Application: How this new learning, understanding, or concept is applied in the workplace.

VI. Evaluation/Comments: This space is provided for instructor's commentary and/or evaluation of the level of success of the lesson. This may include the duration of time on task, student comments about the lesson, instructor comments about the lesson, and instructor observations on how to improve, expand, or further customize the lesson.. Initially, this information was used to revise and improve pilot lessons for replicable models of instruction. As instruction continues, it is a valuable way for the instructor to keep track of particular strengths or weaknesses of a lesson, things to remember when teaching, etc.

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Planning and Scheduling

Time Requirements

This class is designed to provide approximately 36 hours of instruction. The format of the course allows the instructor the flexibility to customized lessons to fit the time available. Due to the variability of students' skill levels and interests, the instructor must make many decisions on lesson length and inclusion.

Size of class

This course can be adapted to work with any size group. If a very large number of participants is scheduled, after initial discussions for activation of prior knowledge, smaller groups should be formed so the instructor can facilitate learning and individual needs can be served.

Expected Outcomes

Participants of this class will improve their skills as required for preparation of apprenticeship testing. Many skill areas are tested by different companies. All the sections in this course may not apply in every situation. Instructors should customize delivery according to the tests used at a particular site. For example, not every company will use analogies for testing verbal reasoning. Omit the section on analogies if it does not apply.

Prerequisites

It is assumed that those taking Apprentice Prep have the reading ability necessary to read the newspaper or popular magazines. It is also assumed that participants have an understanding of the 4 math operations--addition, subtraction, multiplication, and division. Though math skills must be refreshed when not used for long periods of time, this course assumes that those in the program will only need a review to build on higher math concepts.

What this course won't do

This class does not address the needs of those who have very limited reading, writing, math skills, and/or difficulty understanding English. It is recommended that participants in this category should be encouraged to seek out ABE (Adult Basic Education) programs .

Suggested timing for each lesson

It is difficult, if not impossible, to give time estimates for lessons. The goal is to suit the lesson to the learners needs. The variables on each topic will include the amount of experience and prior knowledge and the skill levels of the participants. Our experience has shown a time range from 20-75 minutes is workable. Some very difficult lessons may require several sessions.

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Verbal Reasoning Lessons & Materials

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Analogies

I. Understanding /Outcome: Define and recognize the components of an analogy. Recognize characteristics and categorize relationships of characteristics.

Materials: Pictures from catalogs and magazine, objects from the work place, envelopes with assortments of pictures.

III. Demonstration	
Activate prior knowledge. Ask if learners have had any experiences with analogies. If learners have no experience, develop the concept with the following steps. 1. Ask, "What options do you look for when buying a new car?" 2. What are the characteristics of a radio and a newspaper? How are they the same? How are they different? 3. How are old age and December the same? How are they different? 4. Show pictures that have some relationship. For example, a picture of baby shoes, running shoes, diapers, and underwear.	Suggested activities. Discuss their experiences. In relation to the tests that use analogies to measure verbal reasoning skills. Elicit relationships of characteristics of objects through discussion 4. Instructor will model the use of pictures from catalogs and magazines to illustrate relationships of characteristics of various objects. Discuss the relationship in the example. Define analogy.

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5. BREAD is to FOOD as OAK is to TREE. UNUSED is to NEW as USED is to OLD. DAY is to NIGHT as NOON is to MIDNIGHT. Manufacturing specific: PRESS SIDE is to OIL PAN as ASSEMBLY SIDE is to FLY WHEEL. 6. Discuss the format of analogies.	6. Some tests use the words ***is to*** and ***as***. Others use colons to separate the parts of the analogy. All are read the same way.

IV. Exercise/Engagement:	
1. Have learners find pairs of pictures to make an analogy. 2. Ask learners to share their analogies.	1. For example, *Cindy Crawford* is to *Mother Teresa* as *Halle Berry* is to *Coretta Scott King.* 2. Elicit characteristics of the pairs and the relationships that they see. How are they the same? How are they different? In the example above, why is each famous? Answers may vary. *Cindy Crawford* is to *young* as *Mother Theresa* is to *old. Halle Berry* is to *acting* as *Coretta King* is to the *Civil Rights Movement.*

V. Workplace Application: Verbal reasoning skills may be measured by apprenticeship tests for skilled trades positions.

VI. Evaluation/Comments:

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Analogies Practice Sheet 1

1. Collar is to shirt as rudder is to _____
2. Skyscraper is to city as barn is to _____
3. Stop is to start as black is to _____
4. Inch is to measure of distance as ounce is to measure of _____
5. House is to mansion as boat is to _____
6. Rooster is to hen as bull is to _____
7. Ice is to heat as fire is to _____
8. Puppy is to dog as calf is to _____
9. Roar is to lion as baaa is to _____
10. Sandwich is to lunch as cereal is to _____
11. Bunk is to bed as sandal is to _____
12. Liverwurst is to sausage as cheddar is to _____
13. _____ is to never as closed is to open.
14. _____ is to candy as apple is to fruit.
15. _____ is to reptile as frog is to amphibian.
16. _____ is to rind as banana is to peel.
17. _____ is to winter as heat is to cold.
18. _____ is to fish as airplane is to bird.
19. _____ is to bird as fur is to animal.
20. _____ is to tractor as pilot is to airplane.
21. _____ is to _____ as _____ is to _____
22. _____ is to _____ as _____ is to _____
23. _____ is to _____ as _____ is to _____
24. _____ is to _____ as _____ is to _____
25. _____ is to _____ as _____ is to _____

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Analogies Practice Sheet 2

Directions: Complete the analogies with a pair that shows the same relationship.

1. Hard is to soft (is the opposite of) as _____ is to _____.
2. Inch is to distance (is a measure of) as _____ is to _____.
3. Scientist is to lab (location of work) as _____ is to _____.
4. Mourner is to sorrow (feels) as _____ is to _____.
5. Rudder is to ship (is part of) as _____ is to _____.
6. Salt is to seasoning (is part of) as _____ is to _____.
7. Simmer is to boil (is similar but less intense) as _____ is to _____.
8. Tug is to tugboat (is part of) as _____ is to _____.
9. Drummer is to band (is a member of) as _____ is to _____.
10. Note is to letter (is a short version of) as _____ is to _____.
11. Pharmacist is to medicine (gives out) as _____ is to _____.
12. Positive is to negative (is the opposite of) as _____ is to _____.
13. Texas is to Dallas (state to city) as _____ is to _____.
14. Dish is to eating (object to action) as _____ is to _____.
15. President is to vice president as _____ is to _____.
16. First is to third as _____ is to _____.

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I. Understanding /Outcome: Analogies address many different kinds of relationships that depend on the understanding of the multiple meanings of words.

Materials: Kinds of Analogies 1 & 2

III. Demonstration	
Activate prior knowledge. Review last analogy lesson.	Suggested activities.

IV. Exercise/Engagement:	
1. Determine the relationship between the first two words in three examples. Ask learners to look at the choices and choose the response that has the same relationship. Ask learners to determine the relationship between the first two words. After discussion, have learners work in pairs, groups, or individually on worksheets. Discuss correct responses. Give learners an opportunity to explain why they chose their answer. Probe for the	1. On the board or overhead, write: Winter is to summer as: a. cold is to wet b. cold is to future c. **cold is to warm** d. cold is to freezing Submarine is to fish as: a. kite is to bird b. **automobile is to bird** c. feather is to bird d. chirp is to bird Arc is to circle as: a. segment is to cube b. **angle is to triangle** c. circle is to cube d. cube is to square

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relationship they find in the first set of words.	

V. Workplace Application: Verbal reasoning skills may be measured by apprenticeship tests for skilled trades positions.

VI. Evaluation/Comments:

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Kinds of Analogies

When completing analogies, the relationship between the first two words may be one of several kinds. The following are possible relationship types. A practice exercise follows each example.

1. **Purpose/Function relationship**

POOL is to SWIM as TRACK is to JOG

STORY is to READ as SONG is to SING

HAMMER is to POUND as BROOM is to SWEEP

GLOVE is to BASEBALL as: a. HOOK is to FISH

b. WINTER is to WEATHER

c. GAME is to PENNANT

d. STADIUM is to SEATS

2. **Cause and Effect relationship**

SOAP is to CLEAN as MUD is to DIRTY

SPEND is to DEBIT as SAVE is to ASSET

RACING is to FATIGUE as: a. TRACK is to ATHLETE

b. ANT is to BUG

c. FASTING is to HUNGER

d. WALKING is to RUNNING

3. **Part to Whole relationship**

PAW is to DOG as FIN is to FISH

FINGER is to HAND as TOE is to FOOT

WING is to AIRPLANE as: a. PATCH is to THREAD

b. REMOVAL is to SNOW

c. STRUGGLE is to WRESTLE

d. FENDER is to CAR

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4. **Action to Object relationship**

BREAK is to GLASS as TEAR is to PAPER

WELD is to METAL as SEW is to FABRIC

KICK is to FOOTBALL as:
a. FARM is to BARN
b. PLAYER is to TEAM
c. MOW is to LAWN
d. DULL is to BRIGHT

5. **Object to Action relationship**

BOW & ARROW is to SHOOT as ROD & REEL is to CAST

EYE is to WINK as MOUTH is to SMILE

STEAK is to BROIL as:
a. CLOTHES is to WASH
b. FLAT is to LEVEL
c. MINUTE is to HOUR
d. DOG is to CAT

6. **Synonym relationship** (Words with similar meanings)

HELP is to AID as GENTLE is to SOFT

WORKER is to EMPLOYEE as SUPERVISOR is to BOSS

ENORMOUS is to HUGE as:
a. BLACK is to WHITE
b. TREE is to ACORN
c. PURSE is to KITCHEN
d. MUDDY is to UNCLEAR

7. **Antonym relationship** (Words with opposite meanings)

WIN is to LOSE as STOP is to GO

BLINDNESS is to SIGN as DEAFNESS is to HEARING

DULL is to SHARP as:
a. HILLY is to UNEVEN
b. SMOOTH is to ROUGH

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c. GREEN is to GRASS

d. WATER is to SWIM

8. **Place relationship**

CHICAGO is to NEW YORK CITY as DALLAS is to BOSTON (city to city)

WASHINGTON DC is to the UNITED STATES as LONDON is to GREAT BRITAIN (Capital to Country)

DETROIT is to MICHIGAN as:

a. CHICAGO is to the UNITED STATES

b. CALIFORNIA is to LOS ANGELES

c. TEXAS is to MISSISSIPPI

d. MIAMI is to FLORIDA

9 **Degree relationship**

COOL is to COLD as SHOUT is to SCREAM

UPSET is to FURIOUS as HAPPY is to ECSTATIC

WARM is to HOT as:

a. STEW is to COOK

b. CUTE is to BEAUTIFUL

c. PROPELLER is to AIRPLANE

d. WINTER is to SNOW

10. **Sequence relationship**

THREE is to SIX as FOUR is to EIGHT

JANUARY is to FEBRUARY as JUNE is to JULY

SPRING is to SUMMER as

a. THURSDAY is to WEDNESDAY

b. MAY is to DECEMBER

c. WEDNESDAY is to THURSDAY

d. FEBRUARY is to JANUARY

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11. **Numerical relationships**

23 is to 25 as 39 is to 41

4 is to 16 as 5 is to 25 (4 x 4 = 16 and 5 x 5 =25)

4 is to 12 as:
a. 10 is to 16
b. 9 is to 27
c. 3 is to 4
d. 12 is to 6

12. **Association relationship** (May be a person, animal, or object related to an environment, action, or equipment.)

CAR is to DRIVER as PLANE is to PILOT

BEAR is to DEN as BEE is to HIVE

PEN is to WRITING as:
a. COLOR is to SIDEWALK
b. PIG is to CHICKEN
c. TELEVISION is to RADIO
d. BRUSH is to PAINTING

13. **Characteristic relationship**

BOOK is to CHAPTER as RECIPE is to INGREDIENT

INCHES is to LENGTH as OUNCES is to WEIGHT

DOLLAR is to MONEY as :
a. MINUTE is to HOUR
b. FOOT is to INCH
c. MILE is to DISTANCE
d. MONTH is to YEAR

Answers: 1. a 2. c 3. d 4. c 5. a 6. d 7. b 8. d 9. b 10. c 11. b 12. d 13. a

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Kinds of ANALOGIES 2 Practice Sheet

1. CALF is to COW as LAMB is to:
   a. KID
   b. SHEEP
   c. GOAT
   d. RAM

2. MEAN is to KIND as FAT is to
   a. OBESE
   b. OVERWEIGHT
   c. THIN
   d. NICE

3. FALL is to TUMBLE as EXPENSIVE is to:
   a. CHEAP
   b. THRIFTY
   c. COSTLY
   d. RIDICULOUS

4. LIGHT is to HEAVY as CONFUSING is to:
   a. DARK
   b. WEIGHTY
   c. MIXED UP
   d. CLEAR

5. SMILE is to GRIN as LOVE is to:
   a. AFFECTION
   b. HATE
   c. HAPPINESS
   d. HOSTILITY

6. CHINESE is to LANGUAGE as DYNAMITE is to:
   a. EXPLOSIVE
   b. DYING
   c. NOISE
   d. ASIA

7. HOUR is to TIME as POUND is to:
   a. FAT
   b. SECOND
   c. WATCH
   d. WEIGHT

8. Jar is to GLASS as CAN is to:
   a. BASKET
   b. TIN
   c. LIQUID
   d. LID

9. UNITED STATES is to NORTH AMERICA as:
   a. GERMANY is to FRANCE
   b. EUROPE is to RUSSIA
   c. BRAZIL is to SOUTH AMERICA
   d. GEORGIA is to MICHIGAN

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10. PROPELLER is to SHIP as
    a. WHEEL is to CARRIAGE
    b. HIGHWAY is to SPEED
    c. BOAT is to FISH
    d. HOUSE is to COTTAGE

11. MACARONI is to CHEESE as
    a. MUSTARD is to MINT
    b. VINEGAR is to CHOCOLATE
    c. BAKERY is to BREAD
    d. PORK is to BEANS

12. SPROUT is to PLANT as:
    a. SPEED is to BLOOM
    b. ROOT is to GROUND
    c. SYMPTOM is to DISEASE
    d. TOOT is to DECAY

13. LOOSE is to BOUND as:
    a. ROPE is to HAND
    b. SPEAKER is to AUDIENCE
    c. TALKATIVE is to QUIET
    d. ENTERTAINER is to ACTOR

14. MAGIC is to AMAZEMENT as:
    a. STAGE is to MANAGEMENT
    b. MEAL is to RESTAURANT
    c. ACTOR is to ACTRESS
    d. ENTERTAINMENT is to ENJOYMENT

15. SCREAM is to SURPRISE as:
    a. MOAN is to PAIN
    b. HUSH is to SOUND
    c. EAR is to FEVER
    d. PRIDE is to PRAISE

16. 2 is to 20 as:
    a. 10 is to 100
    b. 3 is to 3000
    c. 10 is to 1000
    d. 100 is to 10

17. PAPER is to DOOR as:
    a. TALK is to JUMP
    b. BEAUTIFUL is to LONG
    c. TABLE is to DISH
    d. INTO is to UPON

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18. NOSE is to MOUTH as:

a. BONE is to SKELETON

b. BLOOD is to CIRCULATION

c. LUNGS are to ASTHMA

d. TOE is to HEEL

19. CAR is to START as

a. SET is to ALARM

b. EAT is to FOOD

c. PHONE is to ANSWER

d. DELIVERY is to MAIL

20. WALK is to FEET as:

a. HAIR is to COMB

b. SING is to VOICE

c. DOOR is to CLOSE

d. COFFEE is to POUR

21. PUDDLE is to RAIN DROP as:

a. COAT is to SLEEVE

b. NUMBER is to LETTER

c. FOOT is to SHOE

d. PLUG is to SOCKET

22. BAT is to SOFT BALL as

a. TOASTER is to TOAST

b. BOWLING BALL is to PINS

c. FISHING ROD is to BAIT

d. GOLF CLUB is to GOLF BALL

23. BOOK is to LIBRARY as:

a. TREE is to LUMBER

b. DISH is to CUPBOARD

c. SINGLE is to TRIPLE

d. RUNNER is to SLED

24. POLICE OFFICER is to GUN as:

a. ARMY SERGEANT is to UNIFORM

b. POST OFFICE is to STAMPS

c. FIREFIGHTER is to AX

d. TEACHER is to STUDENTS

25. TRACTOR is to FARM as:

a. CAR is to DRIVE

b. TRUCK is to LOAD

c. TRICYCLE is to CHILD

d. HI LO is to FACTORY

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Kinds of Analogies 2 Practice Sheet Answer Key:

1. b. Sequence (Young to old)
2. c Antonym
3. c Synonym
4. d. Antonym
5. a Degree
6. a Part to Whole
7. d Characteristic
8. b Characteristic
9. c Place
10. a Part to Whole
11. d Association
12. c. Sequence (Beginning)
13. c Antonym
14. d Cause and Effect
15. a Cause and Effect
16. a Numerical
17. c Grammatical
18. d Part to Part
19. c Object to Action
20. b Action to Object
21. a Whole to Part
22. d Purpose
23. b Association (Object/Environment)
24. c Association (Occupation/ Tool)
25. d Association (Object/Environment)

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Analogies Practice Sheet 3 -- First and Last Missing

1. _____ is to avenue as house is to _____

   a. mansion: wealth

   b. street : home

   c. highway: speed

   d. jewels: diamonds

2. _____ is to ship as wheel is to _____

   a. propeller: carriage

   b. transportation: train

   c. cycle: bicycle

   d. wagon: caravan

3. _____ is to nut as milk is to _____

   a. tree: acorn

   b. bleed: hurt

   c. mix: blender

   d. almond: beverage

4. _____ is to light as dark is to _____

   a. sun: night

   b. electric: night

   c. heavy: bright

   d. sun: day

5. _____ is to post office as vegetable is to _____

   a. stamps: garden

   b. snow; hurricane

   c. mail box: farmer

   d. mail: market

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6 _____ is to blizzard as wind is to _____

a. rain: hurricane

b. snow: hurricane

c. flood: tornado

d. winter: storm

7 _____ is to correct as wrong is to _____

a. proper: right

b. incorrect: failure

c. right: incorrect

d. left: incorrect

8. _____ is to distance as ounce is to _____

a. long; bottle

b. mile: yard

c. yard: pressure

d. inch: weight

9 _____ is to meat as apple is to _____

a. beef: Fruit

b. veal: pear

c. cow: pineapple

d. fruit: carbohydrate

Answers: 1. b 2. a 3. d 4. c 5. d 6. b 7. c 8. d 9. a

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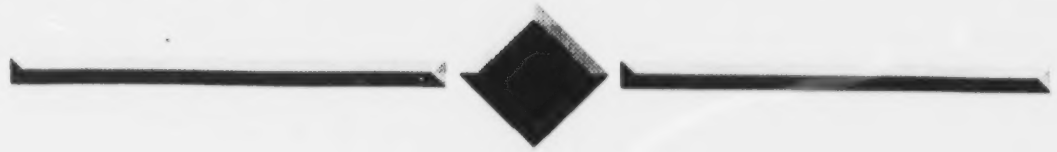
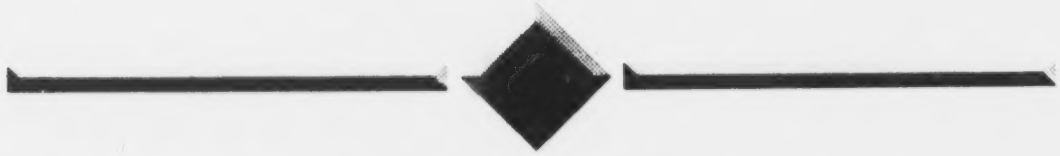


Numerical Reasoning Lessons & Materials



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Whole Language Math Instruction

The Whole Language philosophy advocates instruction based on the learner's experience with numbers and concepts as opposed to teaching skills in isolation with drills and exercises in workbooks. Problem solving is best learned in interactive situations in which the instructor guides the learners as they explore possible problem-solving strategies. Learners develop understandings of math concepts as they become proficient in the language of math though verbal communication, written explanations of answers and problems based on real life situations.

On the other hand, traditional mathematics instruction is based on developing proficiency in computation. A typical lesson begins with the instructor demonstrating the solution for a particular type of problem. After the demonstration, the learners practice by solving similar problems in a work book or on work sheets. The learners' role is to observe the instructor's demonstration and then apply the procedure to the practice problems. Usually students do this independently and interaction between learners is infrequent. Due to the unique situations that may occur in the workplace, we promote using the Whole Language approach. We recognize that traditional methods may be required.

3 C's--Comprehend Compute Communicate Comprehend

(Adapted from Thomas G. Sticht & Barbara A. MacDonald, *Automotive Trades Information Processing Skills: Mathematics*. Glencoe-Macmillan/McGraw-Hill, New York, 1993.)

- Identify the problem to be solved and how mathematics can be used to solve it.
- Identify the numbers that are needed to set up the problems.

Compute

- Decide what operation is needed to do it.
- Predict the outcome. (Will the answer be larger or smaller than the parts?)
- Do the problem.

Communicate

- Communicate the results to others or yourself in writing.

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Math Memories

I. Understanding /Outcome: Building on past experiences to enhance learning

II. Materials: Accompanying supplementary materials: *Math Memories*

III. Demonstration	
Hand out a sample math test and ask students to just LOOK at it a minute or two. Ask them to think about the kinds of feelings that looking at the math test produced.	Suggested activities.

IV. Exercise/Engagement:	
Then pass out *Math Memories* sheet. Ask students to complete the sentences. Be sure to clarify that no names should be put on these sheets because it doesn't matter for this exercise. Once *Math Memories* is completed, collect them and shuffle them and redistribute them so everyone reads someone else's. Put labels for 3 categories on the board; *Positive*, *Negative*, and *Neutral*. Considering their own experiences and the other sheets they have read, try to categorize the kinds of math experiences the students in the class have had.	1. This activity is designed to deliberately recapture feelings about school math experiences. Most adults in these math classes have had negative experiences The point of this lesson is to help students recognize that they are not alone in their fears and anxieties about math. By encouraging students to attend to their feelings about math instead of avoid them, it is hoped that feelings of isolation will be reduced and group discussion and sharing will be promoted. (Taken from *The Long Road to Exorcism* by Joy Walker, Good Practice, July 27, 1995. http://www.deet.gov.au/pubs//g_p/gp27/story1.htm)

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V. Workplace Application: Opening lines of communication on sensitive issues can enhance learning in many situations.

VI. Evaluation/Comments:

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No name please.

Math Memories

When I think about math_____.

The best thing about math was _____.

The worst thing about math was _____.

When it comes to math, I was always _____.

The best math teacher I ever had was _____.

The reason s/he was so good was _____.

The worst math teacher I ever had was _____.

The reason s/he was so bad was _____.

When it comes to math, if I knew then what I know now, I would

_____.

Whenever I try to do word problems _____.

Math has always seemed to be _____.

When it comes to math, the only thing I'm really sure about is _____

_____.

I'd like to learn about _____.

In my life, I need math to _____.

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Introduction to Math Operations

I. Understanding /Outcome:
The use of numbers in the workplace and daily life--practical applications of basic math operations.

Materials: Checkbook, calendar, ruler, catalogue, menu, grocery store advertisement, SPC charts, work-related forms, clock, etc. Chalk board, pencils and paper.

III. Demonstration	
Activate prior knowledge. 1. Introduce use of numbers in daily life. 2. Discuss ways of using number operations during the day--when do you have to add, subtract, multiply or divide?	Suggested activities. 1. Display assorted items. "In what ways have you had to use numbers in the past 24 hours (or week)?" 2. Discuss and list on board, "What did you have to do with these numbers?" Possible responses are count, check date, pay for groceries, fill up gas tank, calculate miles per gallon, etc.

IV. Exercise/Engagement:	
1. Identify basic operations and provide examples of using each operation. 2. Have students decide if they would like to spend time reviewing the 4 operations. 3. Discuss the most common problems with each operation.	1. What math operations did you use in the last week? 2. With a partner, list as many ways as you can think of that you use math. 3. Students may not speak freely about math deficiencies in a group. Give them an opportunity to write about math experiences or

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4. Pretesting basic operations helps students better assess their math skills.	frustrations in their journal so math instruction can be individualized. Note: Generating examples of math problems from work and home situations is more desirable than using the standard pages that follow.

V. Workplace Application: Employees must use basic math operations to in many work situations including SPC charts (range and average) and to function in everyday life (balance checkbook, figure tips, etc.).

VI. Evaluation/Comments:

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Whole Number Review

Add

1.
$$\begin{array}{r} 74 \\ 23 \\ 80 \\ +\ 22 \\ \hline \end{array}$$

2.
$$\begin{array}{r} 14 \\ 82 \\ 51 \\ +\ 46 \\ \hline \end{array}$$

3.
$$\begin{array}{r} 98 \\ 19 \\ 97 \\ +\ 73 \\ \hline \end{array}$$

4.
$$\begin{array}{r} 98 \\ 35 \\ 49 \\ 8 \\ +\ 93 \\ \hline \end{array}$$

5.
$$\begin{array}{r} 38 \\ 95 \\ 56 \\ +\ 97 \\ \hline \end{array}$$

6.
$$\begin{array}{r} 383 \\ 558 \\ 214 \\ +\ 635 \\ \hline \end{array}$$

7.
$$\begin{array}{r} 685 \\ 378 \\ 298 \\ +\ 419 \\ \hline \end{array}$$

8.
$$\begin{array}{r} 496 \\ 545 \\ 339 \\ +\ 108 \\ \hline \end{array}$$

9.
$$\begin{array}{r} 332 \\ 479 \\ 283 \\ +\ 476 \\ \hline \end{array}$$

10.
$$\begin{array}{r} 8613 \\ 8000 \\ 9678 \\ 3159 \\ +\ 2718 \\ \hline \end{array}$$

11.
$$\begin{array}{r} 41263 \\ 87190 \\ 36850 \\ 23367 \\ +\ 70201 \\ \hline \end{array}$$

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Subtract

1. 71 - 38	**2.** 807 - 216	**3.** 4930 - 1038
4. 5671 - 1084	**5.** 67592 - 48111	**6.** 65758 - 26946
7. 54629 - 20099	**8.** 61287 - 20698	**9.** 21248 - 11447

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Multiply

1. 16 x 20	**2.** 36 x 77	**3.** 89 x 99
4. 289 x 998	**5.** 8736 x 605	**6.** 2671 x 803
7. 2000 x 701	**8.** 9503 x 431	**9.** 10000 x 100

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Divide

1. 36 -:- 12 =

2. 57 -:- 19 =

3. 720 -:- 36 =

4. 26010 -:- 45 =

5. 1288 -:- 23 =

6. 70488 -:- 89 =

7. 1248 -:- 42 =

8. 6272 -:- 24 =

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Place Value

I. Understanding /Outcome:
Place value is critical to understanding whole number operations: addition, subtraction, multiplication, and division.

Materials: Tally sticks for ones, tens, hundreds, rubber bands, Handout: Place value chart

III. Demonstration	
Activate prior knowledge. Discuss need for getting in the right line or place. Discuss need for being in the right place.	Suggested activities: 1. Did you ever get in the wrong line when waiting for something (getting tickets, waiting for rides at an amusement park)? 2. Did you ever have to add a column of amounts of money and the numbers were not lined up? (Keeping track of expenses on a trip)

IV. Exercise/Engagement:	
1. Use tally sticks to show place value.	1. In pairs have students count out 12 sticks, putting a rubber band around 10 showing 1-ten and 2-ones.
2. Discuss and write random numbers, indicating place value of number. (Use single and double digit numbers with tally sticks)	2. Continue showing numbers with tally sticks and have students write numerals.
3. Review place value chart	3. Emphasize the need for zero as a place holder writing numbers.
4. Give several examples of	4. 42, 103, 1.5, 15.3 1002, 10.02

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whole and decimal numbers.	

V. Workplace Application: Place value is basic to understanding all math operations used in the workplace.

VI. Evaluation/Comments:

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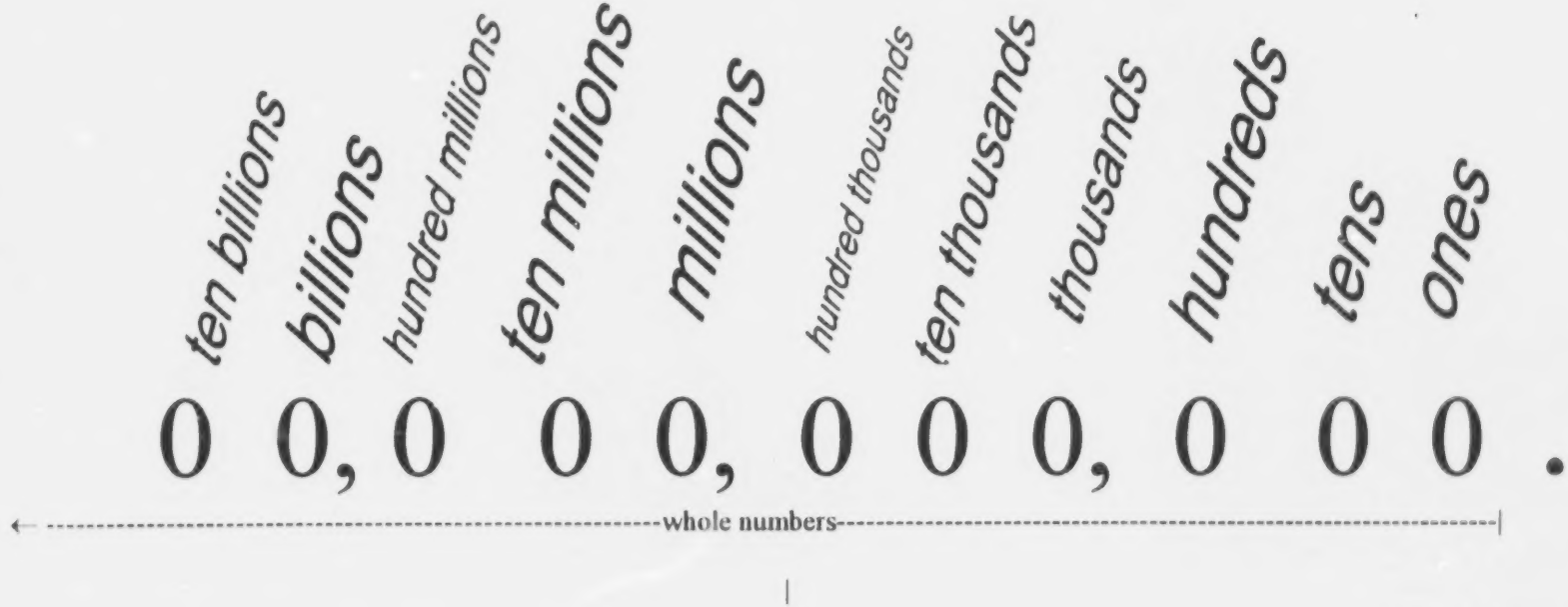
Whole Number Place Value Chart



56

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Divisible Number

I. Understanding /Outcome:
Determining divisible numbers when two numbers are given.

Materials: Pennies, poker chips, beans, etc.
Graph paper, pencils, hand out.

III. Demonstration	
Activate prior knowledge. 1. Develop understanding of having a number divide equally into a given number.	Suggested activities. 1. Can you think of a time when you brought home several small items (such as candy, baseball cards, pennies) to be divided among children or a group? 2. How did you determine if there would be enough to go around equally without someone getting less?

IV. Exercise/Engagement:	
1. Provide hands-on experience dividing equally.	1. Give each learner 36 small counters and let them figure out how to divide them equally without any left over.
2. Use graph paper to show equal division.	2. Using graph paper, have learners mark off 24 squares in many different ways --2 x 12 3x 8 4x6
3. Determine divisible numbers when given two numbers.	3. In pairs, have learners determine which numbers are divisible by which number.

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V. Workplace Application:
Finding divisible numbers is a foundation math skill which is necessary for building an understanding for fractions and decimals.

VI. Evaluation/Comments:

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Divisible Numbers Practice Sheet

1. 32 is exactly divisible by which number?
   a. 5
   b. 3
   c. 8
   d. None of these

2. 63 is exactly divisible by which number?
   a. 7
   b. 5
   c. 8
   d. None of these

3. 120 is exactly divisible by which number?
   a. 7
   b. 6
   c. 9
   d. None of these

4. 104 is exactly divisible by which number?
   a. 9
   b. 10
   c. 8
   d. None of these

5. 336 is exactly divisible by which exactly number?
   a. 11
   b. 7
   c. 9
   d. None of these

6. The sum of 21 and 12 is exactly divisible by which number?
   a. 10
   b. 9
   c. 11
   d. None of these

7. The sum of 28 and 53 is exactly divisible by which number?
   a. 9
   b. 8
   c. 6
   d. None of these

8. The sum of 81 and 69 is exactly divisible by which number?
   a. 6
   b. 5
   c. 4
   d. None of these

9. The sum of 125 and 69 is exactly divisible by which number?
   a. 5
   b. 2
   c. 7
   d. None of these

10. The sum of 420 and 264 is divisible by which number?
   a. 12
   b. 11
   c. 14
   d. None of these

Answers: 1 c 2 a 3 b 4 c 5 b 6 c 7 a 8 b 9 d 10 a

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I. Understanding /Outcome:
Fractions are parts of a whole; understanding the numerator and denominator.

II. Materials:
Pita bread (one for each), apples, whole graham crackers, knives, or cardboard circles and scissors.

III. Demonstration	
Activate prior knowledge. 1. Introduce the concept of breaking a whole into parts.	Suggested activities. 1. When you get a pizza, it is usually cut into equal slices. If you have a pie or cake, how is it usually divided? (Equal parts) 2. What other things are usually divided into equal parts?

IV. Exercise/Engagement:	
1. Give hands on experience with dividing wholes into fractional parts.	1. Give each pair of learners a pita, apple, graham cracker, and a knife. Have them divide the whole items into equal parts. With each divided item, have them indicate the whole (ex. 4/4) and parts of a whole (ex. 3/4).
2. Discuss the concept of *fractions*--parts of a whole.	2. How would you write the number to show a part of the whole?
3. Introduce *numerator* and *denominator*.	3. Explain that the numerator tells how many parts and the denominator

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4. A discussion of equivalent fractions may follow to show that 2/4 is equal to 1/4 or 4/8. 5. Discuss when employees use fractions in the workplace.	shows how many parts the whole was divided into.

V. Workplace Application: Understanding fractions is necessary in reading measurements and other workplace applications.

VI. Evaluation/Comments:

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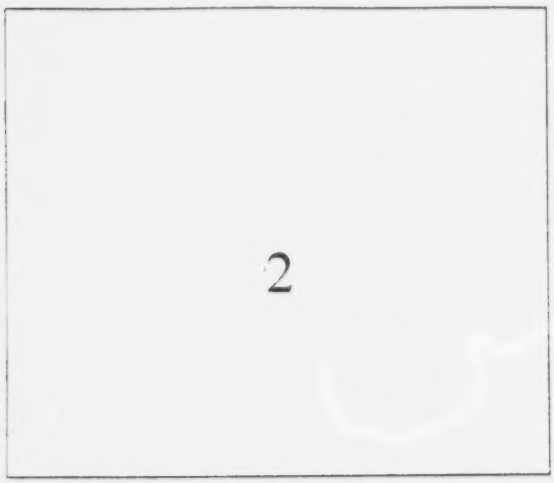
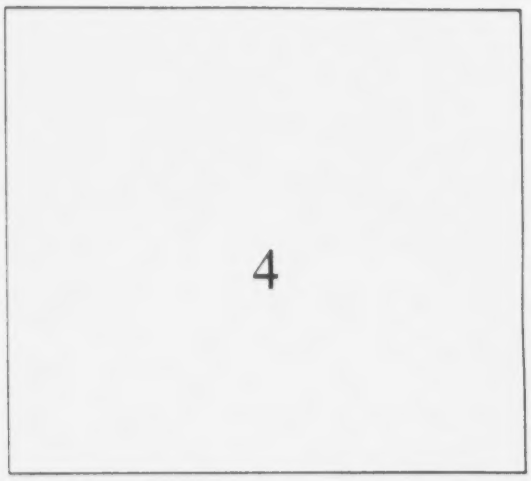
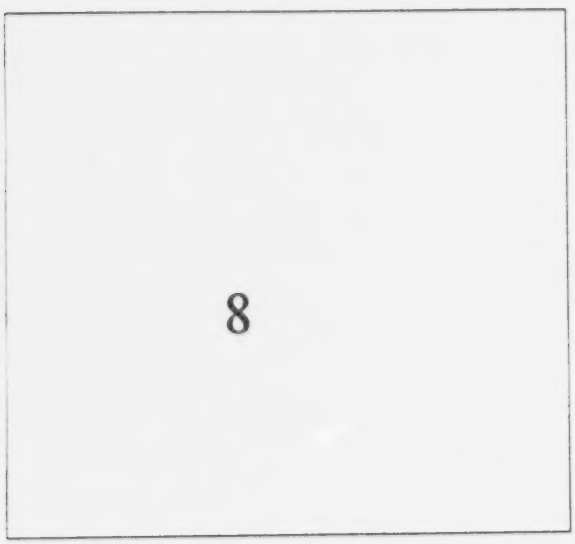
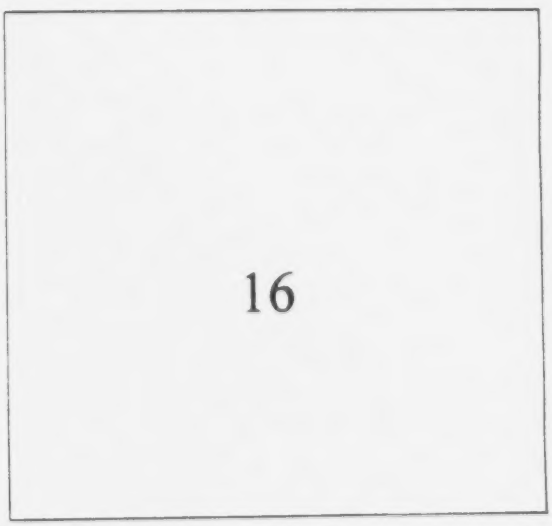
Fraction Work Sheet

Divide the boxes below into the number of equal parts stated in the box.









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Fractional Equivalents Work Sheet

Using the boxes on the last page, answer the following questions.

1. How many fourths are there in one half? _____

2. How many eighths are there in one half? _____

3. How many sixteenths are there in one fourth? _____

4. How many sixteenths are there in three fourths? _____

5. How many sixteenths are there in one half? _____

$\frac{1}{2} = \frac{2}{4} = \frac{4}{8} = \frac{8}{16}$

_____

6) add $\frac{1}{4} + \frac{1}{4}$

Shade in your answer.

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Math with Fractions Work Sheet

Add the following fractions. Be sure to reduce your answer to the lowest terms.

1. $\frac{1}{2} + \frac{1}{2}$

2. $\frac{2}{3} + \frac{1}{3}$

3. $\frac{1}{5} + \frac{1}{5}$

4. $\frac{1}{9} + \frac{4}{9}$

5. $\frac{1}{8} + \frac{3}{8}$

6. $1\frac{1}{7} + 2\frac{1}{7}$

7. $3\frac{1}{4} + 1\frac{1}{4}$

8. $4\frac{1}{11} + 1\frac{2}{11}$

9. $9\frac{6}{15} + 2\frac{3}{15}$

10. $3\frac{1}{4} + 1\frac{1}{4}$

11. $3\frac{3}{8} + 2\frac{1}{8}$

12. $6\frac{1}{14} + 2\frac{1}{14}$

13. $12\frac{7}{8} + 11\frac{5}{8}$

14. $4\frac{4}{5} + 2\frac{3}{5}$

15. $3\frac{1}{8} + 6\frac{7}{8}$

16. $9\frac{1}{8} + 6\frac{7}{8} + 2\frac{5}{8}$

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Common Denominator Work Sheet

Write a common denominator for the following fractions:

1. $\frac{1}{2}$ $\frac{1}{4}$ _____

2. $\frac{1}{3}$ $\frac{1}{9}$ _____

3. $\frac{1}{4}$ $\frac{1}{6}$ _____

4. $\frac{1}{9}$ $\frac{1}{6}$ _____

5. $\frac{1}{5}$ $\frac{1}{10}$ _____

6. $\frac{1}{3}$ $\frac{1}{4}$ $\frac{1}{6}$ _____

7. $\frac{1}{5}$ $\frac{1}{10}$ $\frac{1}{20}$ _____

8. $\frac{1}{7}$ $\frac{1}{9}$ $\frac{1}{3}$ _____

9. $\frac{1}{9}$ $\frac{1}{3}$ $\frac{1}{6}$ _____

10. $\frac{1}{12}$ $\frac{1}{5}$ $\frac{1}{3}$ _____

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Adding Mixed Fractions Work Sheet

Reduce your answer to the lowest possible terms.

1. $6\frac{1}{2} + 2\frac{1}{3}$

2. $2\frac{1}{4} + 1\frac{1}{8}$

3. $7\frac{1}{4} + 3\frac{1}{6}$

4. $9\frac{1}{5} + 1\frac{1}{10}$

5. $7\frac{1}{8} + 1\frac{1}{6}$

6. $8\frac{1}{4} + 1\frac{1}{2}$

7. $12\frac{1}{2} + 8\frac{1}{6}$

8. $14\frac{3}{7} + 12\frac{1}{3}$

9. $14\frac{9}{10} + 11\frac{4}{5}$

10. $17\frac{1}{8} + 12\frac{1}{3}$

11. $19\frac{3}{5} + 12\frac{7}{8}$

12. $23\frac{9}{10} + 10\frac{4}{6}$

13. $15\frac{4}{5} + 10\frac{11}{15}$

14. $35\frac{1}{7} + 12\frac{1}{9}$

15. $1\frac{1}{2} + 2\frac{1}{6} + 1\frac{1}{3}$

16. $11\frac{2}{7} + 8\frac{1}{3} + 4\frac{1}{6}$

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Subtracting Mixed Fractions Work Sheet 1
Reduce your answer to the lowest possible terms.

1. $3\frac{1}{4} - 1\frac{3}{4}$

2. $4\frac{1}{6} - 1\frac{5}{6}$

3. $2\frac{1}{9} - 1\frac{5}{9}$

4. $6\frac{1}{7} - 4\frac{3}{7}$

5. $12\frac{1}{9} - 6\frac{4}{9}$

6. $13\frac{1}{14} - 12\frac{5}{14}$

7. $12\frac{1}{25} - 11\frac{7}{25}$

8. $14\frac{1}{7} - 10\frac{2}{7}$

9. $7\frac{9}{16} - 2\frac{1}{3}$

10. $15 - 1\frac{1}{4}$

11. $36 - 5\frac{1}{9}$

12. $7\frac{1}{16} - 2\frac{5}{64}$

13. $12\frac{1}{4} - 6$

14. $7 - 2\frac{1}{4}$

15. $7\frac{1}{4} - 5\frac{3}{8}$

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Subtracting Mixed Fractions Work Sheet 2
Reduce your answer to the lowest possible terms.

1. $3\frac{2}{5} - 1\frac{1}{5}$ _____

2. $4\frac{1}{2} - 1\frac{1}{6}$ _____

3. $9\frac{7}{8} - 2\frac{7}{8}$ _____

4. $12\frac{5}{6} - 8\frac{1}{6}$ _____

5. $9\frac{4}{5} - 2\frac{1}{10}$ _____

6. $11\frac{3}{4} - 3\frac{1}{6}$ _____

7. $4\frac{7}{8} - 1\frac{1}{3}$ _____

8. $12\frac{8}{15} - 1\frac{1}{3}$ _____

9. $7\frac{2}{3} - 1\frac{5}{6}$ _____

10. $12\frac{3}{5} - 1\frac{7}{10}$ _____

11. $178\frac{4}{5} - 51\frac{1}{3}$ _____

12. $52\frac{3}{8} - 16\frac{23}{32}$ _____

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Multiplying Fractions Work Sheet 1
Reduce your answer to the lowest possible terms.

1. $\frac{1}{2} \times \frac{1}{2} =$

2. $\frac{1}{4} \times \frac{1}{4} =$

3. $\frac{4}{5} \times \frac{1}{6} =$

4. $\frac{1}{5} \times \frac{2}{5} =$

5. $\frac{4}{5} \times \frac{7}{10} =$

6. $\frac{3}{8} \times \frac{2}{5} =$

7. $\frac{4}{5} \times \frac{6}{10} =$

8. $\frac{8}{14} \times \frac{6}{12} =$

9. $\frac{3}{12} \times \frac{5}{20} =$

10. $\frac{4}{15} \times \frac{6}{10} =$

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Multiplying Fractions Work Sheet 2

Reduce your answer to the lowest common denominator.

1. $1\frac{1}{2} \times 1\frac{1}{2} =$

2. $1\frac{5}{7} \times 2\frac{1}{24} =$

3. $2\frac{1}{7} \times 2\frac{4}{5} =$

4. $5\frac{1}{3} \times 2\frac{1}{4} =$

5. $1\frac{7}{9} \times 4\frac{1}{2} =$

6. $4\frac{2}{5} \times 2\frac{8}{11} =$

7. $1\frac{7}{10} \times 1\frac{11}{14} =$

8. $2\frac{2}{9} \times 5\frac{2}{5} =$

9. $2\frac{1}{5} \times 1\frac{13}{22} =$

10. $1\frac{3}{16} \times 1\frac{13}{19} =$

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Dividing Fractions Work Sheet

Reduce your answer to the lowest possible terms.

1. $\frac{1}{2}$ -:- $\frac{1}{2}$ =

2. $\frac{1}{3}$ -:- $\frac{1}{3}$ =

3. $\frac{3}{4}$ -:- $\frac{2}{3}$ =

4. $\frac{3}{8}$ -:- $\frac{1}{2}$ =

5. $\frac{7}{8}$ -:- $\frac{3}{5}$ =

6. $\frac{7}{12}$ -:- $\frac{1}{3}$ =

7. $\frac{3}{4}$ -:- $\frac{4}{7}$ =

8. $\frac{5}{12}$ -:- $\frac{5}{6}$ =

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Word Problems with Mixed Fractions

1. Fred has the following lengths of 1 / 2 -inch copper pipe: $8\frac{5}{16}$ inches, $12\frac{1}{2}$ inches, $9\frac{3}{4}$ inches, and 26 inches. If he welds together the three shortest lengths, what will be the length in inches of this new piece of pipe?

A. $28\frac{7}{16}$

B. $30\frac{9}{16}$

C. $29\frac{1}{4}$

D. $28\frac{11}{16}$

2. Fred works as a truck driver. His keeps track of his delivery route each day. Last Friday he drove $10\frac{1}{2}$ miles for his first stop, $14\frac{6}{10}$ miles for the second stop, and $1\frac{3}{10}$ of a mile for the third stop. How many miles did he drive all together?

A. $25\frac{1}{2}$

B. $26\frac{7}{10}$

C. $26\frac{2}{5}$

D. $26\frac{1}{2}$

3. The following Friday Fred drove the same amount of miles (see problem 2) but he took the truck to the garage at the end of the day. The garage was 6 1/5 miles from his last stop on that day. How far did he have to drive?

A. $31\frac{2}{5}$

B. $33\frac{4}{5}$

C. $32\frac{3}{5}$

D. $32\frac{1}{5}$

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4. The factory needed new security fencing around the plant. The land around the factory measured $3\frac{7}{10}$ miles on each of its four sides. How many miles of security fencing is needed to replace the old fencing?

A. $14\frac{1}{5}$ miles of fencing

B. $13\frac{8}{10}$ miles of fencing

C. $12\frac{3}{10}$ miles of fencing

D. $14\frac{8}{10}$ miles of fencing

5. The value of ABC Company stock went from $19\frac{3}{8}$ to $21\frac{1}{4}$ between June 1 and June 30. How many points in value did the stock change during the month of June?

A. $\frac{7}{8}$

B. $1\frac{1}{4}$

C. $1\frac{3}{8}$

D. $1\frac{7}{8}$

6. New rods for the welding machine had to be cut. One rod measured $10\frac{5}{16}$ and the other rod measured $5\frac{7}{8}$. What is the difference in length between the two rods?

A. $4\frac{7}{16}$

B. $5\frac{7}{16}$

C. $4\frac{3}{16}$

D. $5\frac{3}{16}$

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7. The factory classroom needed to be painted. Tim mixed 5 6 of a pint of thinner in each gallon of paint he used. How many pints of thinner did Tim use to complete the job that requires 24 gallons of paint?

A. 18 pints.
B. 20 pints
C. $18\frac{5}{6}$ pints
D. 22 pints

8. The hi-lo-driver clocks the distance traveled each day. He works 8 hours and drives $31\frac{7}{10}$ miles each day. How many miles does he drive each 5 day week?

A. 158 miles
B. $160\frac{7}{10}$ miles
C. 159 miles
D. 125 5/7 miles
E. None of these

9. If an oil drip pan weighed 10 1/2 pounds how many could you cut from an 840 pounds of steel (do not be concerned about scrap pieces) ?

A. 91 drip pans
B. 80 drip pans
C. 84 drip pans
D. 108 drip pans

10. If one box holds 14 machine brackets, how many boxes are needed to pack 430 machine brackets?

A. 30 boxes
B. 42 boxes
C. 31 boxes
D. 45 boxes

Answers: 1. b $30\frac{9}{16}$. 2. c $26\frac{2}{5}$ 3. c. $32\frac{3}{5}$ 4. a $14\frac{1}{5}$ miles of fencing 5. d $1\frac{7}{8}$ 6. a $4\frac{7}{16}$ 7. b 20 pints 8. 125 5/7 miles 9. 80 drip

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Finding the Value of an Unknown

I. Understanding /Outcome:
To find the value of an unknown whole number or fraction in the 4 basic operations.

Materials:

III. Demonstration	
Activate prior knowledge. 1. Here is a bag with an object inside. How can we figure out what is in the bag without looking inside? Discuss as a group. 2. Let participants ask questions (like the game *20 questions*) to narrow down the possibilities. Help the group understand that there are certain clues necessary to successfully determine the unknown quantity.	Suggested activities. 1. Present the group with a mystery bad to stimulate thinking of an unknown. 2. Determine what is needed to figure out an unknown quantity. l;

IV. Exercise/Engagement:	
1. Write each of the following on the board: 2 + n = 10 (Read: 2 plus what number equals 10.) 8 - n = 3 3 x n = 27 48 -:- n = 6 2. What do we need to know to solve these problems? What operations should we	

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use? Elicit answers from the class. 3. Have learners work on the hand out in pairs, groups or individually. 4. Discuss as a group which problems were most difficult and why? 5. Encourage students to think aloud the process by which they solved the problem.	

V. Workplace Application: This concept is tested on most apprenticeship screenings.

VI. Evaluation/Comments:

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Finding Unknown Whole Numbers Work Sheet

1. What number should replace N in this correct multiplication example?

   24N a. 0 b. 1 c. 4 d. 7

   X 2

   494

2. What number should replace B in this correct addition example?

   2BBB6 a. 0 b. 3 c. 4 d. 6

   + 3BB5

   27991

3. What number should replace M in this correct subtraction example?

   115 a. 5 b. 6 c. 7 d. 8

   - M5

   40

4. What number can replace R to make this number sentence true?

   $\frac{5}{R} = \frac{R}{20}$ a. 10 b. 12 c. 15 d. 20

5. What number should replace P to make the number sentence true?

   35 + P + 48 = 107 a. 125 b. 36 c. 24 d. 27

6. What number should replace Q to make the number sentence true?

   $\frac{7}{Q} = \frac{Q}{63}$ a. 14 b. 28 c. 21 d. 17

7. If $n = 6$, the $4 + 3n =$ a. 22 b. 24 c. 18 d. 25

8. What number should replace D in this correct multiplication example?

   3DD4 a. 4 b. 7 c. 3 d. 5

   X 6

   21324

Answers: 1. d 2. c 3. c 4. a 5. c 6. c 7. a 8. d

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Order of Operations

I. Understanding /Outcome: To use the correct order of operations for working out math problems.

Materials:

III. Demonstration	
Activate prior knowledge. 1. Brainstorm what comes to mind when any problem needs to be solved. 2. How are the steps determined? 3. List all the steps one might go through for a problem like a car breakdown. 4. Is the order of the steps important? Why?	Suggested activities. 1. Discuss a recent problem and the things that were considered when solving the problem. (Car break down, someone goes to emergency, etc.) 2. Discuss what determines when steps to solve a problem are taken and the order of the steps. 3. Give reasons why it is important to follow certain steps.

IV. Exercise/Engagement:	
1. Present the problem 15 + 2 x 3 = 2. Ask students to solve the problem alone or in groups. 3. Did everyone get the same answer? 4. If not, ask students to explain how they got their answers. 5. Work problems applying the concept of *order of operations*.	1. Is there more than one right answer in math? 2. Provide information or handout on order of operations if no one in the class has explained it to the group. 3. What is important to know in order to get the correct answer?

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V. Workplace Application: A necessary concept to understand in order to pass apprenticeship test.

VI. Evaluation/Comments:

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Order of Operations

Order of operations was developed there would only be one correct answer for each problem. To get the corre answer, the operations (must be done in the correct order.

1. Do all work inside parentheses fi · and any work above and below fraction bars.
2. Simplify exponents and roots.
3. Start at the left and do both multiplications and divisions working toward the right.
4. Start at the left and do both additions and subtractions working toward the right.

P E M D A S can help you remember the correct order. It could stand for **P**lease **E**xcuse **M**y **D**ear **A**unt **S**ally.

P	**P**arentheses and fraction bars
E	**E**xponents and roots
MD	**M**ultiplication and **D**ivision
AS	**A**ddition and **S**ubtraction

Remember, not every problem will have all the steps, always follow the order in the box above.

Here is an example:

5 x (3 + 2) + 4 – 8 = (Parentheses first, no fraction bars)

5 x 5 + 4 – 8 = (No exponents or roots)

25 +4 –8 = (Multiplication, no division)

29 – 8 = (Addition, then subtraction)

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Introduction to Decimals

I. Understanding / Outcome:
Understanding the concept of decimals: how to read and write decimals.

Materials: Dollars, pennies, nickels, dimes, quarters, half dollars, completed time sheets, decimal place value chart, pencils, paper.

III. Demonstration	
Activate prior knowledge. Introduce the concept of decimals.	Suggested activities. 1. If you wrote a check for groceries for $42.36 (write on board), how would you know which numbers represented dollars and which numbers represented cents? (The decimal point separates whole numbers from parts of a whole.) 2. Where else do you use decimals? (Time sheets, checkbook, metric measurements, etc.)

IV. Exercise/Engagement:	
1. Determine place value of numerals with decimal point. 2. Read and write decimals. 3. Discuss decimals used in the workplace. How do different jobs use decimals?	1. Using real dollars and coins, have learners write the amount of money shown. Explain the value of each number written. Use place value chart to reinforce the concept of decimal place value.

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V. Workplace Application: Decimals are used on SPC charts, metric measurement, and in daily life situations.

VI. Evaluation/Comments:

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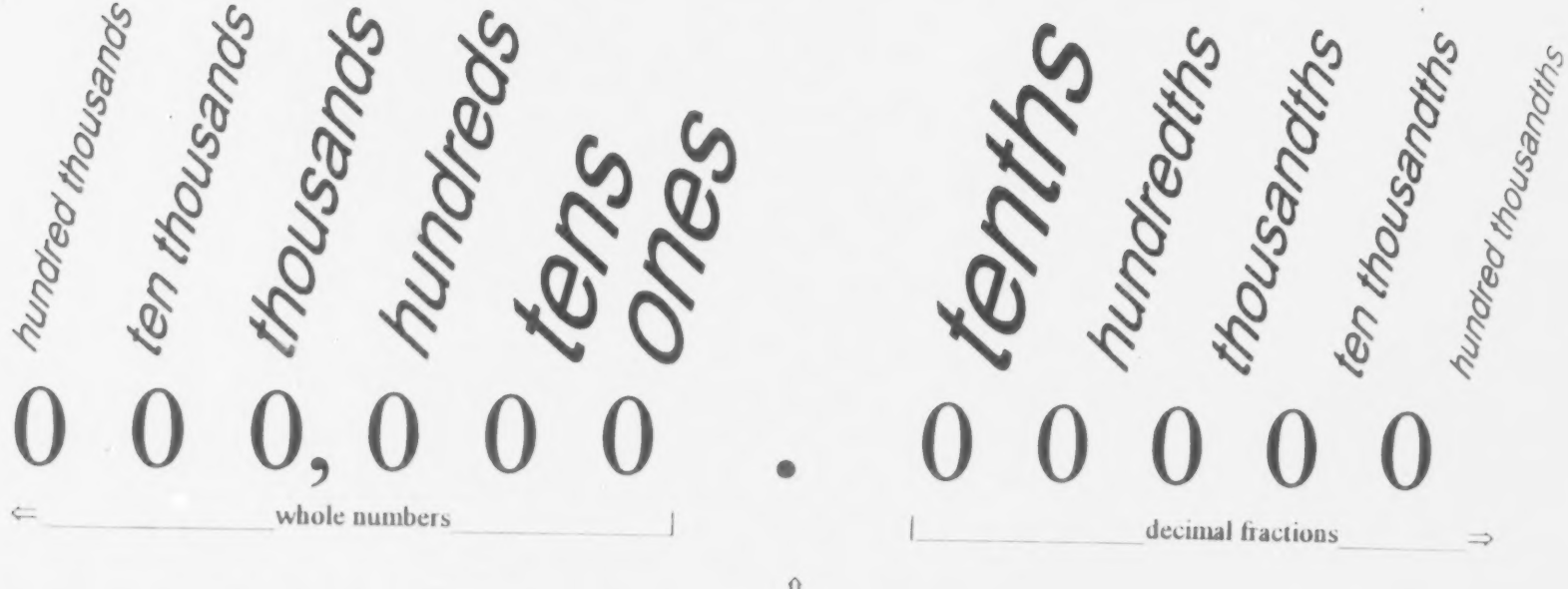
Place Value



81

85

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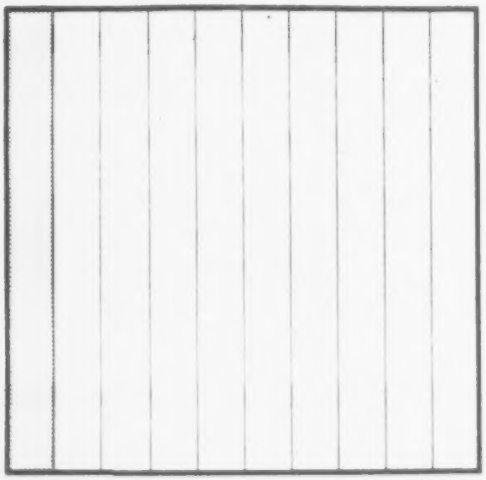
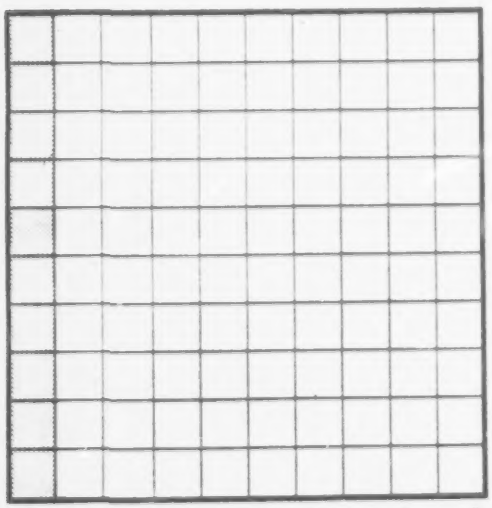
Money and Decimals Work Sheet

Name: _____ **Date:** _____



This square is divided into tenths.

1. What decimal is represented by the shaded bar? _____



This square is divided into hundredths.

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2. What decimal is represented by the shaded bar? _____

3. What coin in our money represents .10 ($\frac{1}{10}$) of one dollar?_____

4. What coin in our money represents .01 ($\frac{1}{100}$) of one dollar?

_____

5. What coin represents .25 of one dollar? _____

6. How many tenths of a dollar are there in fifty cents? _____

7. How many hundredths of one dollar are there in fifty cents?

_____

Write the following amounts as a decimal.

8. thirty seven cents _____
9. nineteen cents _____
10. eight cents _____
11. seventy five cents _____
12. eighty six cents _____
13. twenty nine cents _____
14. three cents _____
15. fifty two cents _____
16. forty cents _____
17. ten cents _____
18. one cent _____
19. ninety six cents _____
20. one dollar and twenty six cents _____
21. In. $5.72, in what place is the 7? _____
22. In $4.95, in what place is the 5? _____

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Adding Decimals 1

Add the following:

1. 6.1 + 2.5 + 4.6 =

2. 634.1 + 4.1 + 796.1 =

3. .61 + 3 + 2.8 + 743.1 =

4. 26 + 7.1 + .05 + .0071 =

5. 6.73 + 4 + .06 =

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Adding Decimals 2

1. 6.80
   +.02

2. 3.4
   + 1.7

3. 2.06
   + 1.1

4. 4.7
   .01
   .002
   + 3.0

5. 8.71
   .121
   + 1.60

6. 3.1 + 2.8 + 4.3 =

7. 2.6 + 4 + .0072 =

8. 4.062 + 2.2 + .007 =

9. .386 + .002 + .5463 =

10. 916.3 + 20.6 + .066 =

11. 4.7 + 1.96 + .001 =

12. .006 + .00046 + 2.2 =

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Subtracting Decimals 1

1. 6.71 - .50 =

2. 38.7 - 2.2 =

3. 47.6 - .40 =

4. 3.71 - .962 =

5. 64.71 - .375 =

6. 1267.83 - 946.32 =

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Subtracting Decimals 2

1. 9.6 - .002 =

2. 4.76 - 1.25 =

3. 15.6 - 3.3 =

4. 106.78 - 9.9 =

5. 387.1 - 132.26 =

6. .0934 - .0012 =

7. .00065 - .000347 =

8. 967.95 - 2.56 =

9. .0073 - .0028 =

10. .0006 - .00059 =

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Multiplying Decimals 1

1. 8.1
   X 2.5

2. 2.6
   X 1.7

3. 11.9
   X .03

4. 1.78 X .21 =

5. .003 X .02 =

6. 175.1 X .00001 =

7. 93.1 X 10 =

8. 33.6 X .002 =

9. .0171 X .363 =

10. .00063 X .0027 =

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Multiplying Decimals 2

1. 3.7
   x 67

2. .36
   x 2.6

3. .71
   x. .86

4. .893
   x .003

5. 783
   x .023

6. .471
   x .001

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Dividing Decimals

1. .06 -:- 2 =

2. 6 -:- .02 =

3. .06 -:- .02 =

4. 3.60 -:- .06 =

5. .360 -:- .006 =

6. 19.88 -:- .28 =

7. 2.346 -:- 5.1 =

8 3600 -:- .0009 =

9. 2.139 -:- 2.3 =

10. 74.8 -:- .44 =

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Finding the Percentage of a Whole Number Work Sheet

1. 5% of 100 = _____

2. 10% of 80 = _____

3. 16% of 80 = _____

4. 35% of 95 = _____

5. 30% of 600 = _____

6. 75% of 400 = _____

7. 60% of 36 = _____

8. 28% of 55 = _____

9. 19% of 400 = _____

10. $66\frac{2}{3}$% of 300 = _____

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Finding a Whole Number when a % of it is Given

I. Understanding / Outcome: Finding a whole number when a % of it is given.

Materials: Board, chalk, markers, calculators, pencils, paper.

III. Demonstration	
Activate prior knowledge. Relate this concept to a workplace situation. Have learners explore possible ways to solve the problem.	Suggested activities. 1. If your company produces 48,000 flywheels a month which is 75% of all flywheels made each month, how many flywheels are manufactured in a month? 2. Predict how you might be able to so this. 3. Work in pairs to try to solve this and have them offer their solutions.

IV. Exercise/Engagement:	
1. Introduce the concept of finding the number when a percent of it is given. 2. Put formula on board and model the solution to the problem. 3. Generate problems from workplace context if possible. Handout is for practice if needed.	1. ***percent x base = amount*** 75% x n = 48,000 To solve, divide each side by the same number. Change % to a decimal. (75%=.75) Divide 48,000 by .75 (Answer 75,000)

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V. Workplace Application: Preparing workers for job-related tests.

VI. Evaluation/Comments:

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Percents

%	
whole / part	8 is _____ % of 64

.125

64 /8.000

6 4

1 60

1 28

32 0

32 0

0

% x whole = part	**6% of 150 = _____**

150

x .06

9.00

whole	
% / part	64 is 25% of _____

2 56.

.25./64.00.

50

14 0

12 5

15 0

15 0

93.

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Changing Fractions to Decimals and to Percents Work Sheet

1. $\frac{1}{2}$ = .50 50%

2. $\frac{1}{4}$ = _____ _____

3. $\frac{1}{5}$ = _____ _____

4. $\frac{1}{8}$ = _____ _____

5. $\frac{2}{5}$ = _____ _____

6. $\frac{5}{8}$ = _____ _____

7. $\frac{9}{10}$ = _____ _____

8. $\frac{7}{12}$ = _____ _____

9. $\frac{7}{8}$ = _____ _____

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10. $\frac{1}{3}$ = _____ _____

11. $\frac{2}{3}$ = _____ _____

12. $\frac{1}{6}$ = _____ _____

13. $\frac{4}{5}$ = _____ _____

14. $\frac{3}{16}$ = _____ _____

15. $\frac{9}{20}$ = _____ _____

16. $\frac{4}{25}$ = _____ _____

17. $\frac{7}{25}$ = _____ _____

18. $\frac{17}{20}$ = _____ _____

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Changing Decimals to Fractions and Percents Work Sheet

Change each decimal to a **fraction in lowest terms** and to a **percent.**

1.	.40	$\frac{40}{100} = \frac{4}{10} = \frac{2}{5}$	40%
2.	.60	_____	_____
3.	.5	_____	_____
4.	.65	_____	_____
5.	.065	_____	_____
6.	.8	_____	_____
7.	.28	_____	_____
8.	.12	_____	_____
9.	.012	_____	_____
10.	.783	_____	_____

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Positive and Negative Numbers

I. Understanding /Outcome:
Recognize and use negative and positive numbers in basic math operations and as used on charts and graphs.

Materials:

III. Demonstration	
Activate prior knowledge. Discuss situations where negative numbers vs. positive numbers are used. a. temperatures above/below zero b. feet below sea level c. checkbook balance with insufficient funds.	Suggested activities. 1. What does this mean in numbers? It is ten degrees below zero today. 2. How is this written ? 3. What is meant by a geographic location that is described as 500 ft. below sea level.

IV. Exercise/Engagement:	
1. Use a thermometer to show temperature above and below zero. 2. Display a number line with a zero mid-point.	1. Problem: the temperature is -5 degrees at 10 P.M. By 11 PM. it is 3 degrees colder. What is the temperature at 11 P.M. 2. Discuss the process of adding 2 negative numbers / 2 positive numbers. (see attached lessons)

V. Workplace Application: Use positive and negative numbers to chart SPC and tested on job-related tests.

VI. Evaluation/Comments:

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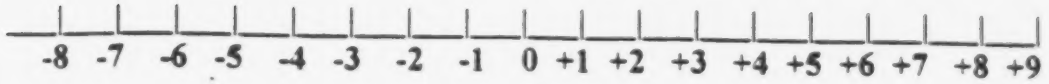
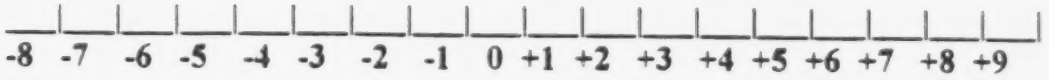
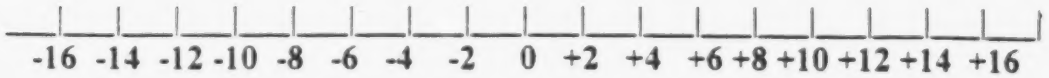
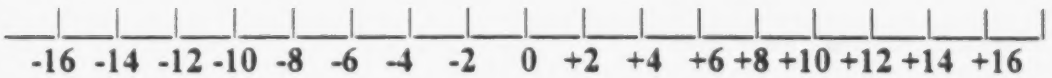
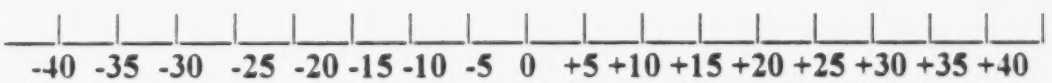
Number Lines

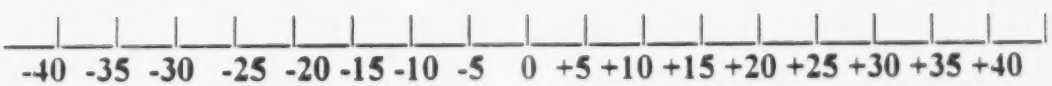












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RULES FOR ADDING AND SUBTRACTING POSITIVE AND NEGATIVE NUMBERS

Addition Rule 1 : To add two or more numbers with the same sign, add the numbers and give the answer the same sign.

Problem: The Gear Right Co. lost $2,000 in sales in May and $1,000 in June. What was their total loss for May and June.

$$\begin{array}{rr} & -\$2{,}000 \\ + & \underline{-\$1{,}000} \\ & -\$3{,}000 \end{array}$$

Addition Rule 2: To add numbers with different signs find the difference between the numbers. Give the answer the sign of the larger number.

Problem: Yesterday morning at 6 A.M. the temperature was 2 degrees below zero. by 2 P.M. the temperature had risen 12 degrees. What was the temperature at 2 P.M.?

$$\begin{array}{rr} & -2 \\ + & \underline{+12} \\ & +10 \end{array}$$

Subtraction Rule: Change the sign of the take away number (the second number in the problem) and follow the rules for addition.

Problem: The temperature at noon was 3 degrees below zero. It was 18 degrees below zero at 8 A.M. What was the difference between the early morning temperature and the noon temperature?

Step 1. Write the problem.

$$\begin{array}{rr} & -3 \\ - & \underline{-18} \end{array}$$

Step 2. Change the subtraction sign (-) to addition (+) and change the number after the subtraction sign to the opposite sign.

$$\begin{array}{rr} & -3 \\ + & \underline{+18} \end{array}$$

Step 3. Add the signed numbers. Remember to follow the rule for adding two numbers with different signs.) Find the difference (subtract) between the numbers and give the answer the sign of the larger.

$$\begin{array}{rr} & -3 \\ + & \underline{+18} \\ & +15 \end{array}$$

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Practice Sheet -Adding and Subtracting Positive and Negative Numbers

1 -10 - (-3) = -10 + (-3) = -13

2 -3 - (-8) =

3 -9 - (-6) =

4 -16 - (-11) =

5 6 - (-17) =

6 0 - (-2) =

(Answers below)

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Answers: 1 -13 2 -5 3 -3 4 -27 5 -23 6 -2

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Practice Sheet -Adding and Subtracting Positive and Negative Numbers

1. -10 - (+3) = -10 + (-3) = -13

2. -3 - (-8) =

3. +9 - (+6) =

4. +16 - (-11) =

5. 6 - (-17) =

6. 0 - (-2) =

(Answers below)

Answers: 1. -13 2. +5 3. +3 4. +27 5. +23 6. +2

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Rules for Multiplying & Dividing Positive and Negative Numbers

To multiply or divide numbers with the *same sign*, give the answer a *positive* sign.

-6 X -3 = +18 or **(-6) (-3) = +18**

-10 -:- -2 = +5 or **-70/-10 = +7**

To multiply or divide numbers with *different* signs, give the answer a *negative* sign.

-5 x +8 = -40 or **(-5) (8) = 40**

-24 -:- +3 = -8 or **-24/3 = -8**

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Rounding Off Numbers

I. Understanding /Outcome: How to round off numbers to a designated place.

Materials: Blackboard, chalk, hand out, paper, pencils, journals Handout:

III. Demonstration	
Activate prior knowledge. 1. Introduce the need for rounding off numbers.	Suggested activities. 1. "If I were pricing a new house that I was interested in buying, I wouldn't tell you it cost $98, 694.26. I would more likely say it was nearly 99 thousand or about 100 thousand." Can you think of other examples of simplifying an exact number? (Federal budget, large hospital bill, estimating cost of home repairs or home improvement.)

IV. Exercise/Engagement:	
1. Provide numbers for learners to round off to a designated place from work or home context. 2. Complete the hand out if concept is unclear or more practice is needed.	1. On the board, write numbers and discuss where they should be rounded off: to the nearest 10, 100, 1000, etc. 2. As a group or in pairs, provide numbers to be rounded off to the nearest _____. 3. Have learner explain procedure for rounding off numbers. 4. Write explanation of process of rounding off in daily log.

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V. Workplace Application: Rounding off numbers is a skill needed in some work -related calculations like estimating the weight of loads on a truck.

VI. Evaluation/Comments:

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Rounding Off Numbers

We round off numbers to make them easier to understand or when accuracy is not necessary. Auto manufacturers publish reports of the number of cars sold in a given time with rounded off numbers.

If 12,624,723 cars were sold in a 6-month period, the number may be rounded off to the nearest hundred *thousand* - 12,600,000.

To round whole numbers, follow these steps:

- Underline the number in the place you are rounding.
  12,<u>6</u>24,723 (6 is in the hundred thousand place)
- Look at the number in the next place to the right of the underlined number. 12,<u>6</u>24,723 (2 is next to the underlined number in this example.)
- If the number to the right is less than 5, leave the underlined number as it is. (2 is less than 5)
- If the number to the right of the underlined number is 5 or more, add 1 to the underlined number.
- Change all numbers to the right of the underlined number to zero.

Practice:

1. Round 5,453 to the nearest ten.
   A. 5,400
   B. 5,450
   C. 5,500
   D. None of these

2. Round 884 to the nearest hundred.
   A. 900
   B. 885
   C. 800
   D. None of these

3. Round 54,230 to the nearest thousand.
   A. 55,000
   B. 54,000
   C. 55,000
   D. None of these

4. Round 453,689 to the nearest hundred thousand.
   A. 500,600
   B. 454,689
   C. 500,000
   D. None of these.

Answers: 1. B 5,450 2. A 900 3. B 54,000 4. C 500,000

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Rounding Off Numbers Work Sheet

1. Round to the nearest 10:

78 _____	53 _____	45 _____
32 _____	985 _____	817 _____
897 _____	432 _____	911 _____

2. Round to the nearest 100:

3,124 _____	6,598 _____	2,912 _____
8,555 _____	8,499 _____	4,150 _____

3. Round to the nearest 1000:

23,798 _____	65,073 _____	98,186 _____
67,599 _____	41,008 _____	99,199 _____

4. Round to the nearest 10,000:

123,456_____	456,987_____	983,129_____
793,108_____	497,296_____	928,376_____

5. Round to the nearest 100,000:

1,497,387 _____	109,477,498_____
8,399,832 _____	986,399,737_____
4,783,925 _____	843,399,000_____

6. Round to the nearest 1,000,000:

123,995,884 _____	165,376,984 _____
974,538,883 _____	170,802,840 _____

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Rounding Decimals

To round a decimal fraction is to simplify the way it is written. This is done by discarding digits that are not needed.

Example:

Erik earns $7.68 for each hour of overtime he works. How much will he earn in 2.4 hours of overtime on Saturday?

Step 1. Solve this problem by multiplying $7.68 by 2.4 = $18.432

$7.68
x 2.4
3072
1536
$18.432

Note that there are 3 decimal places in the answer in this problem.

Step 2. To write $18.432 as dollars and cents we want to keep only 2 digits to the right of the decimal point. Answer: $18.43

Rounding Decimals

(Rounding numbers with decimals is done the same way that whole numbers are rounded)

Step 1. Select the number place you are rounding to. $18.43̲2

Step 2. Look at the number to the right of the underlined number.

a. If the number is less than five $18.432 (2 is less than 5) leave the underlined number as it is.

b. If the number to the right is more than 5, add 1 to the underlined number

$18.43̲6 (6 is more than 5) Rounded Number = $18.44

Example

Round $12.1756 to the nearest cent. Rounded Number = $12.18

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Abstract Reasoning Lessons & Materials

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Abstract Reasoning

I. Understanding /Outcome: Given items in a sequence, the test-taker will be able to determine which item comes next.

Materials: Cardboard shapes, pattern sheets, paper and markers for designing sequences. Abstract reasoning handout.

III. Demonstration	
Activate prior knowledge. 1. Think of ways sequences occur in our lives? (Days of week, months of the year, phases of the moon, leap year, etc.)	Suggested activities. 1. When I say, "Spring, summer, fall . . ." what would logically follow fall? Show a picture of a "Big Mac" type hamburger. What is the sequence of ingredients from top to bottom?
2. Explain the reason for focusing on this skill.	2. Why is this necessary? Have you ever answered question on a test that measured your ability to do this?

IV. Exercise/Engagement:	
1. Instructor models sequencing activity.	1. Instructor will show patterns of objects in a sequence on board or flip chart. Students will determine what object follows.
2. Students design sequences.	2. In groups or pairs, students will design a sequence and have a partner complete it. Materials may be from the shop floor, various paper shapes, sequences drawn with markers,

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3. Instructor will provide a handout with sequences of shapes. Learners will determine what completes the sequence.	numbers or letters. 3. In pairs, students will discuss and complete the handout.

V. Workplace Application: Abstract reasoning is a section of the DAT which is used to screen apprenticeship candidates.

VI. Evaluation/Comments:

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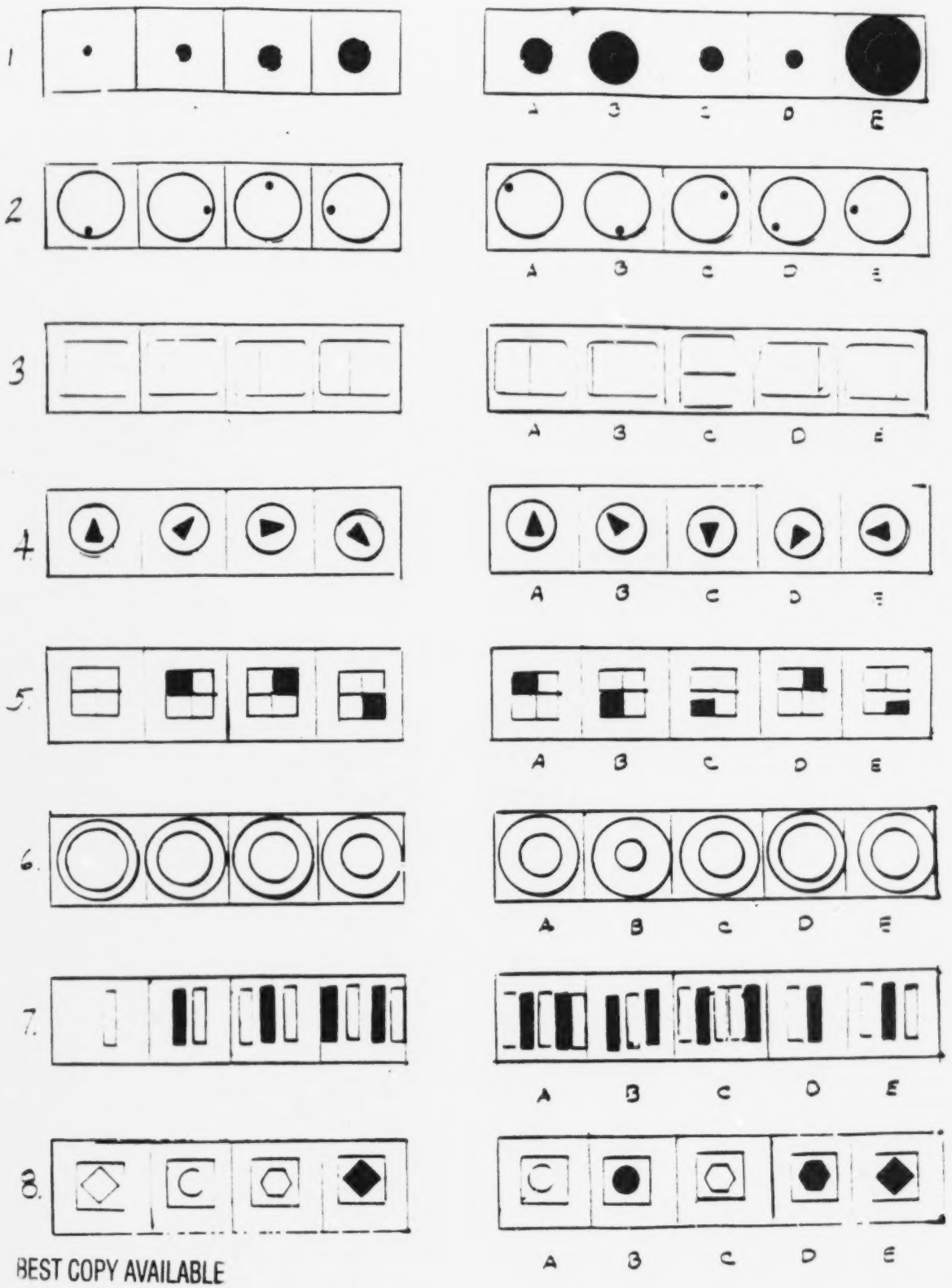
Abstract Reasoning Practice Sheet 1



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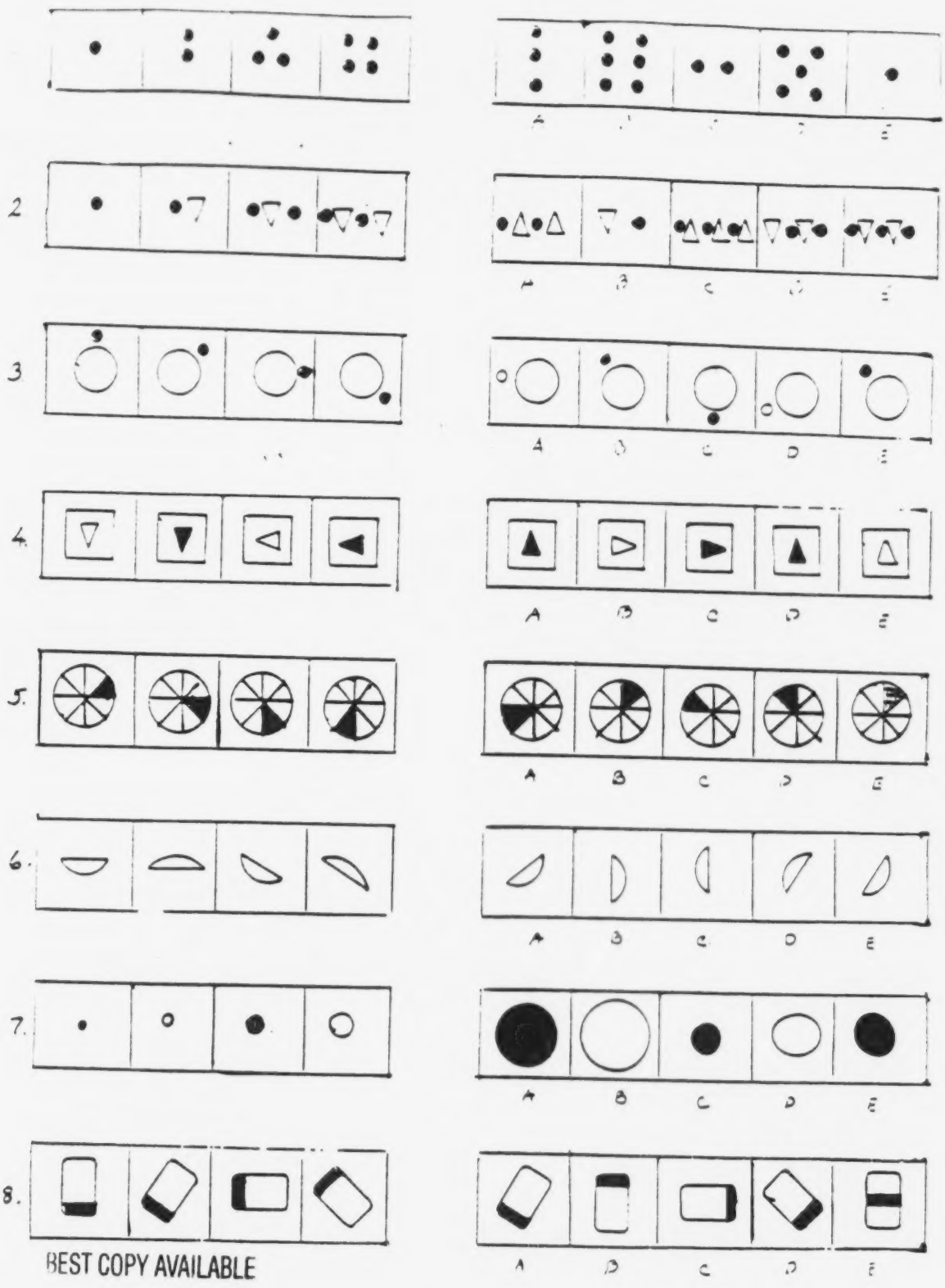
Abstract Reasoning Practice Sheet 2



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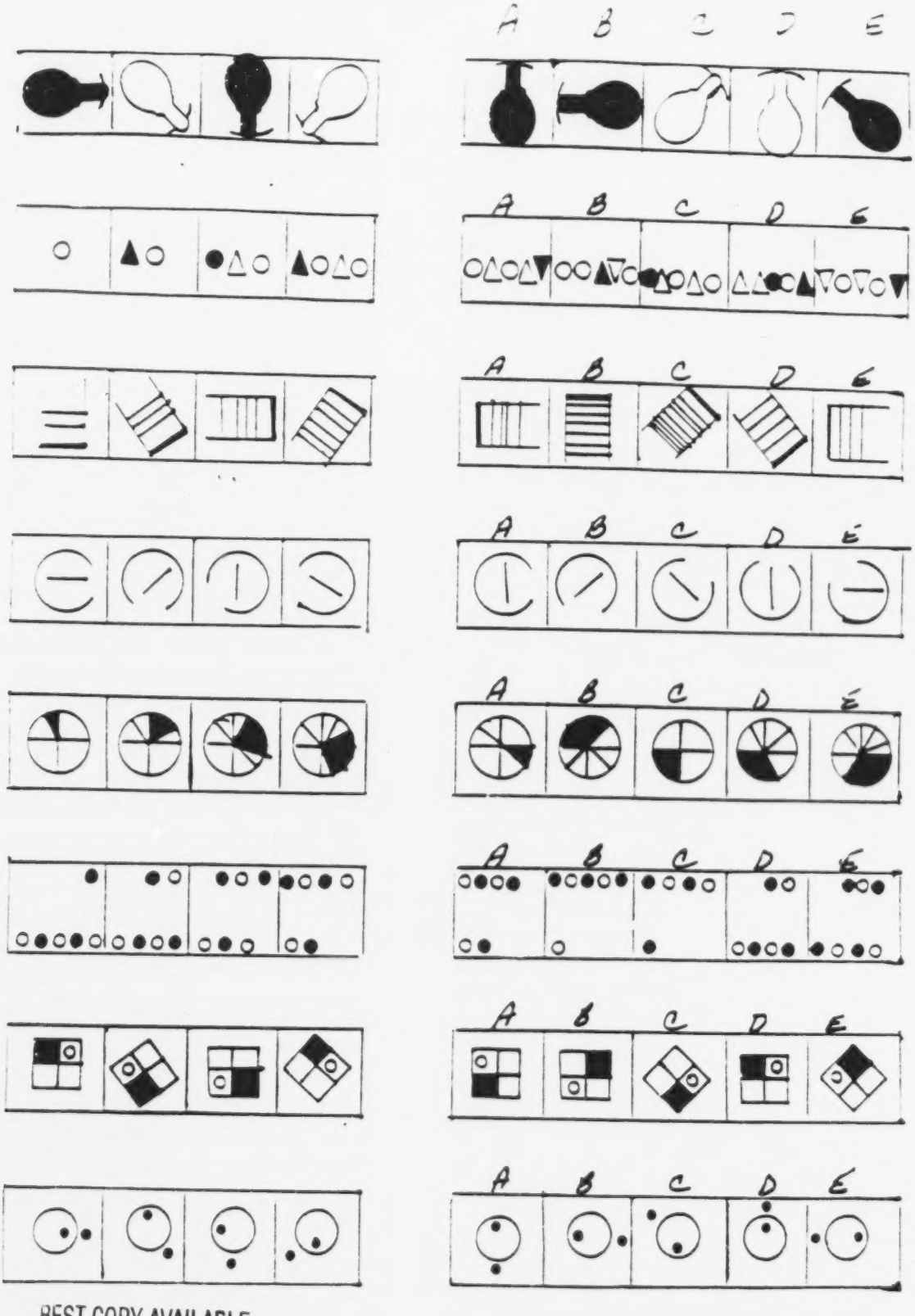
Abstract Reasoning Practice Sheet 3



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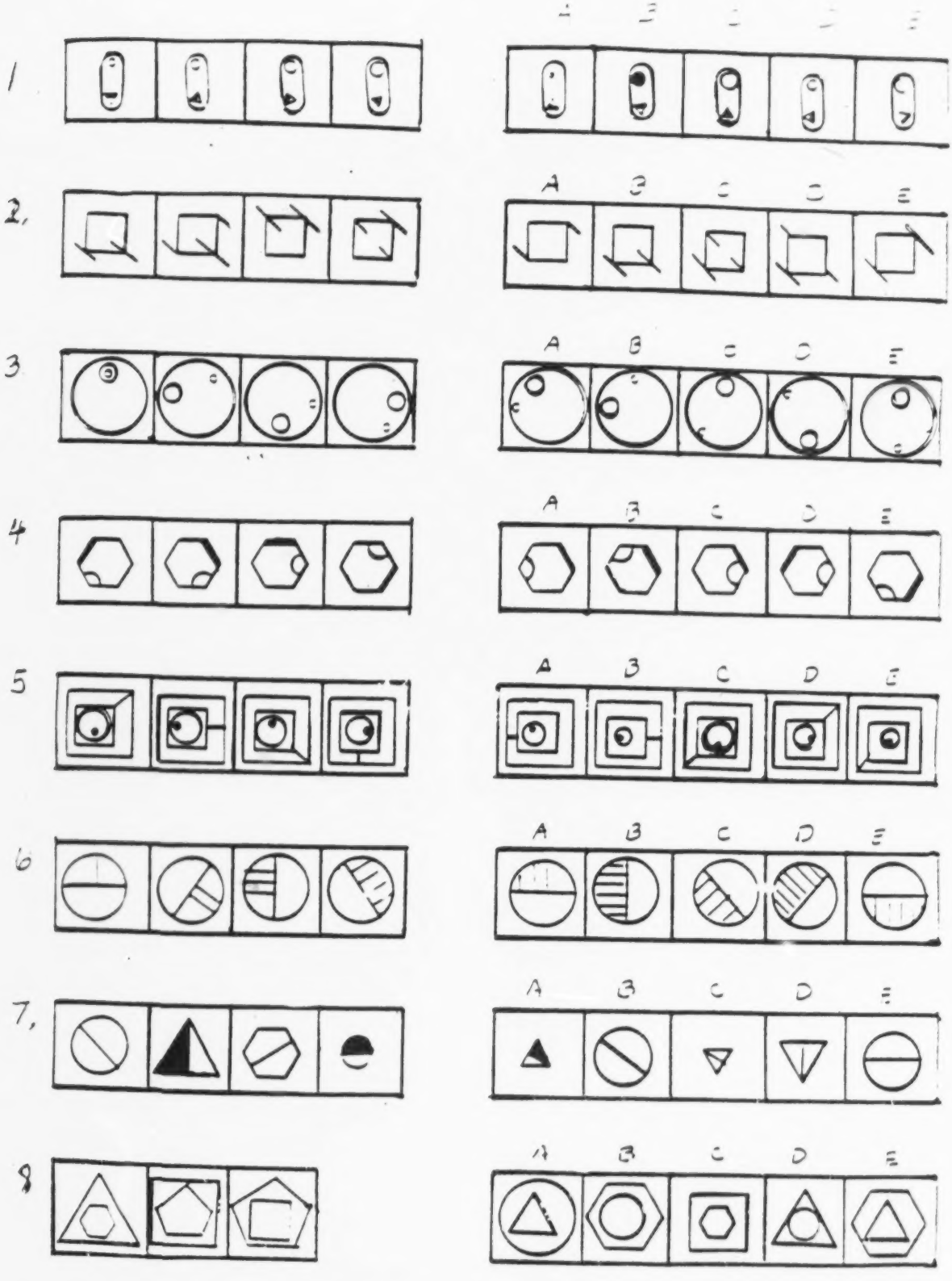
Abstract Reasoning Practice Sheet 4



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Mechanical Reasoning Lessons & Materials

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Directional Effect

I. Understanding /Outcome:
The directional effect of objects can be predicted.

Materials:
Heavy balls, such as golf or billiard balls, different shaped blocks, empty boxes, toy objects (cars) pop bottles, etc. Directional effect handout.

III. Demonstration	
Activate prior knowledge. Discuss directional impact of one object upon another.	Suggested activities. "In playing a game like pool, how can you control the direction the balls will move?" What happens? "Can you think of other things that can be controlled by the way they are struck? (Bumper cars, bowling, etc.)

IV. Exercise/Engagement:	
Provide hands-on activity for determining effect of directional impact. Use handout to predict and discuss directional effect in figures	In pairs/ individually, let students predict impact and then use objects to demonstrate directional effect. Look at items on handout and predict and complete exercises.

V. Workplace Application: Directional effect is part of the Mechanical

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Reasoning section of tests used for screening apprenticeship candidates.

VI. Evaluation/Comments:

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Gears, Pulleys, Braces

I. Understanding /Outcome:
Mechanical knowledge of gears, pulleys, and braces.

Materials:
Suggestions: Hand held drill, hand held eggbeater, working model of gears (possibly Legos or Erector set), hand out.

III. Demonstration	
Activate prior knowledge. Discuss items that are familiar to students that have gears, pulleys and braces.	Suggested activities. Show hand drill, egg beater. Ask, "What have you worked with recently that used gears or pulleys?" "How do gears and pulleys make work easier? "Have you ever had to brace a shelf to hold a heavy item?"

IV. Exercise/Engagement:	
1. Describe actual diagrams/pictures in handout. 2. Read questions to determine what diagram or picture represents.	1. In pairs or groups, discuss hand out items and possible variations. When possible, draw other ways the items could be shown for different mechanical effects (directionality, weight distribution, efficiency, etc.) 2. Answer questions on handout. Give explanation to support answer.

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V. Workplace Application: Understanding the effects of gears and pulleys is tested on the Mechanical Reasoning section of tests used for screening apprenticeship candidates.

VI. Evaluation/Comments:

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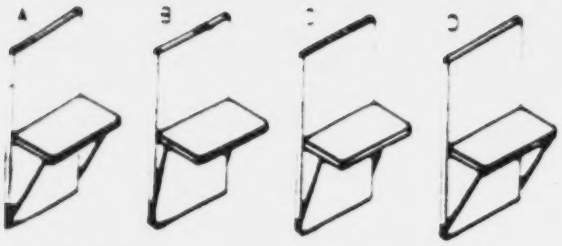
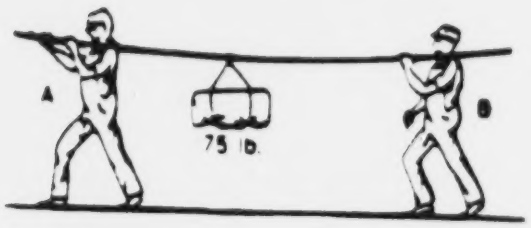
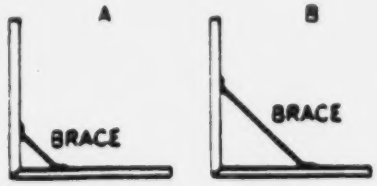
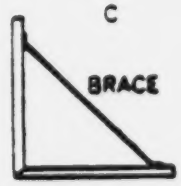


1. Which shelf could support the most weight?
   A) A
   B) B
   C) C
   D) D

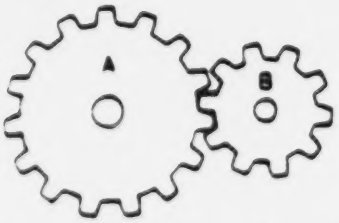


2. The weight is being carried entirely on the shoulders of the two men shown. Which man bears the most weight on his shoulder?
   (A) A
   (B) B
   (C) Both men are carrying the same.
   (D) It is impossible to tell.



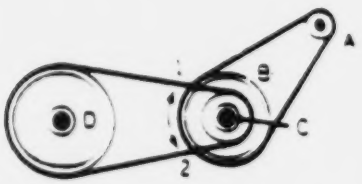


3. Which of the angles is braced most securely?
   (A) A
   (B) B
   (C) C
   (D) All equally braced.

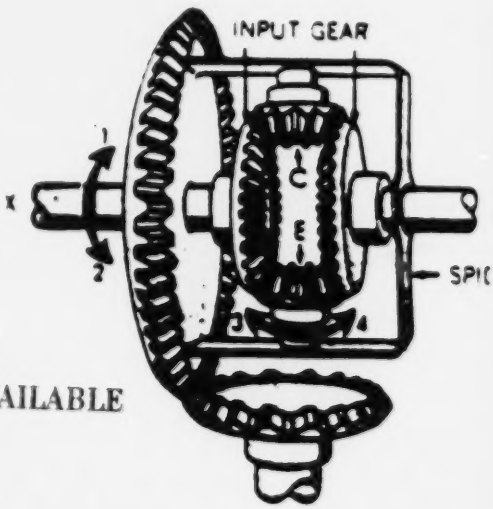


4. Which gear will turn faster?
   A) A
   B) B
   C) Both will turn at same rate.

5. If arm H is held fixed as gear B turns in direction 2, gear
   (A) A must turn in direction 1
   (B) A must turn in direction 2
   (C) I must turn in direction 2
   (D) A must be held fixed.



6. If pulley A is the driver and turns in direction 1, which pulley turns fastest?
   (A) A
   (B) B
   (C) C
   (D) D



7. If shaft X turns in direction 1 and shaft Y is fixed, gear C will turn in direction
   (A) 3 and gear E in direction 3
   (B) 3 and gear E in direction 4
   (C) 4 and gear E in direction 3
   (D) 4 and gear E in direction 4

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Space Relations Lessons & Materials

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Space Relations

I. Understanding /Outcome: To gain experience visualizing a 3-dimensional figure from a 2-dimensional figure.

Materials: Pattern of cube. Learner will fold and construct a 3-dimensional cube. Various other patterns will be provided for hands-on experience for mastering this concept. Paper, scissors, rulers, etc. for design of patterns. Practice sheet of space relations problems presented in testing format.

III. Demonstration	
Activate prior knowledge. 1. Ask students to tell what they know about the word *dimension. What are dimensions? What is the difference between 2 dimensional and 3 dimensional objects.* 2. Ask students to think of occupations or occasions that require the ability to look at a 2-dimensional pattern and visualize a 3-dimensional figure. Also ask the opposite--when do you look at a 3 dimensional figure and visualize a 2 dimensional layout or pattern.	Suggested activities. 2. Possible situations are looking a floor plans for a house or blueprints. Sheet metal workers have to look at the type of ductwork needed and be able to cut a pattern from a flat sheet of metal.

IV. Exercise/Engagement:	
1. Give students the pattern for a cube, and have them fold it and construct a 3 dimensional cube. 2. Provide other patterns for hands-on and discussion.	1.

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3. Ask students to design a 2 dimensional pattern for a 3 dimensional figure. 4. Distribute the practice sheet for testing format and ask learners to work individually or in pairs.	

V. Workplace Application: Space relations is tested in some apprenticeship screening situations.

VI. Evaluation/Comments:

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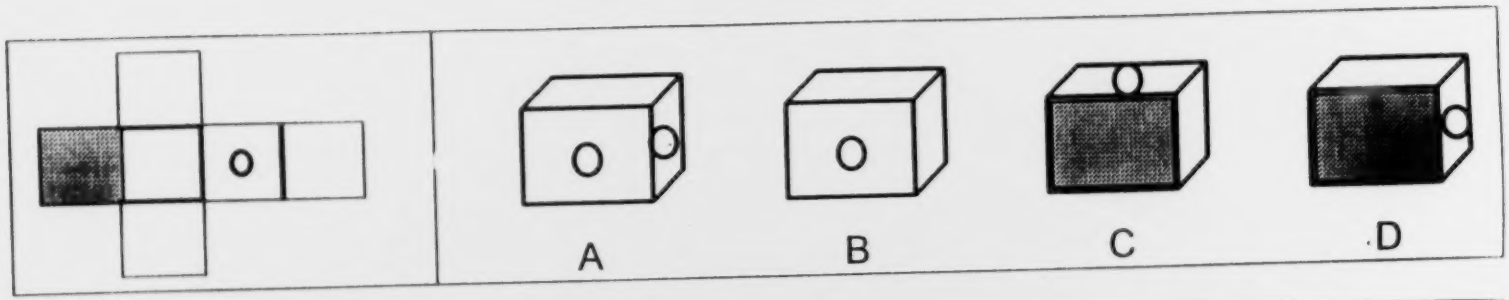
Space Relations

1.



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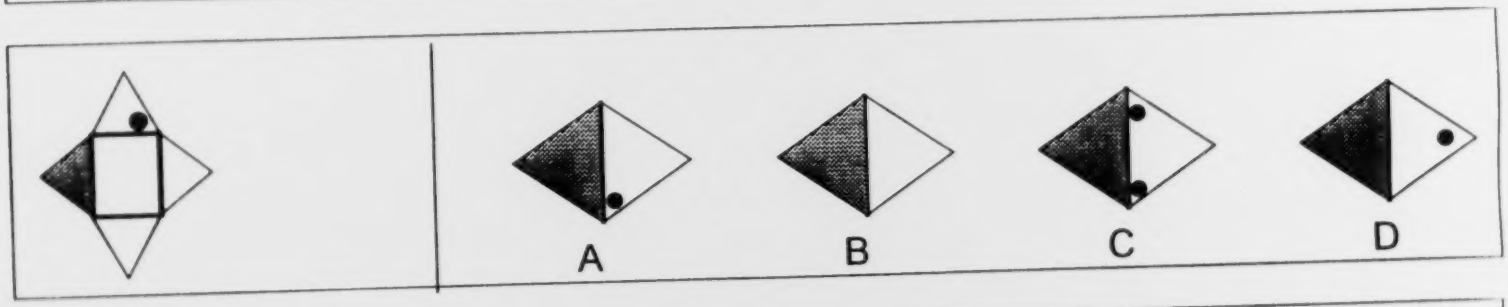

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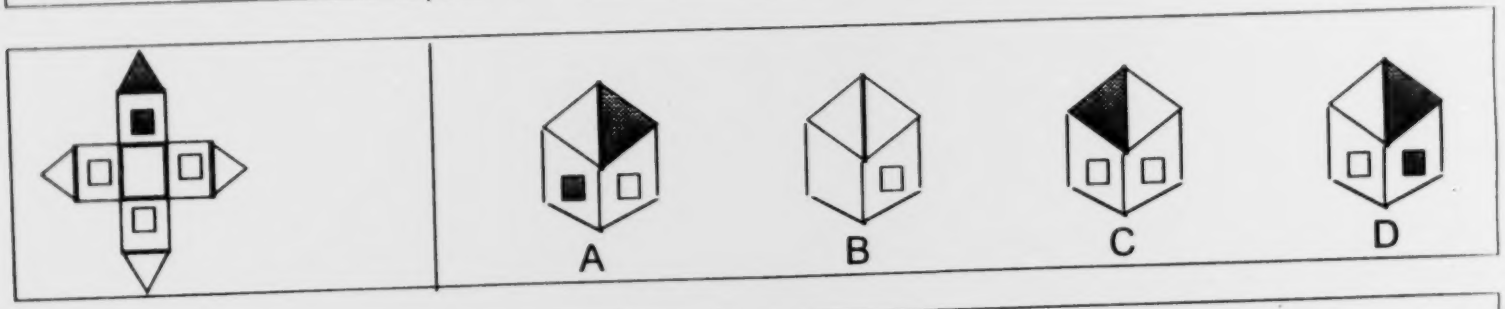

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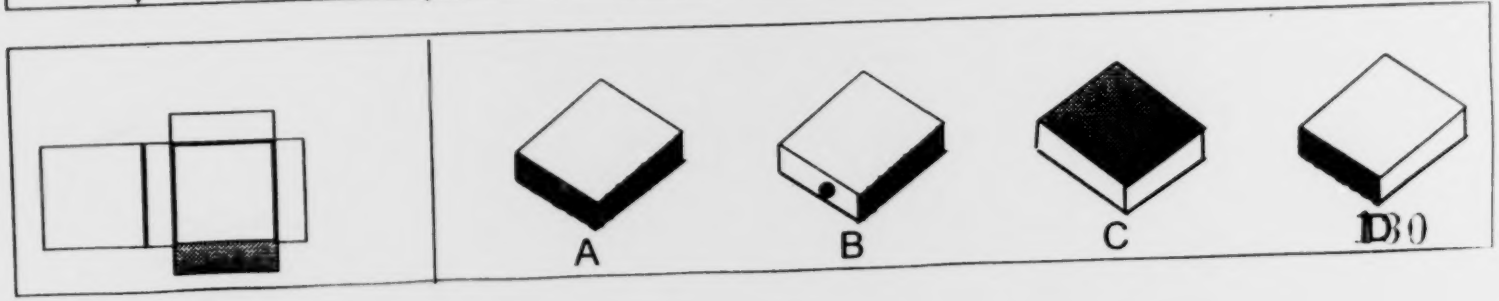

Space Relations Practice Sheet

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Test Taking Lessons and Materials

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Overcoming Negative Attitudes about Tests

I. Understanding /Outcome: Attitude and preparation can make a difference in test performance.

Materials: "Ladder of Achievement"

III. Demonstration	
Activate prior knowledge. 1. Discuss feelings and attitudes connected to "tests."	Suggested activities. 1. When I say the word "test", what comes to your mind? 2. How do you feel about taking tests? 3. Can you think of a time you took a test that didn't go well? 4. What thoughts went through you mind when you got ready for that test? 5. What might have helped you do better in that situation? 6. What attitude is most helpful when taking a test?

IV. Exercise/Engagement:	
1. Instructor role plays a test taker with a poor attitude who rushes into the room, unprepared, has no knowledge of the test or test format.	1. Discussion: What could the employee have done to change his attitude about taking this test? 2. Brainstorm. 3. Probe questions for further

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Scenario: Employee has been instructed to take a die setting test at 2:00 PM on Monday. Employee arrives one minute before test is scheduled with no pencil, no glasses, and no understanding of what the test covers. "My supervisor told me to be here at 2 o'clock. What does this test cover? I don't know if I really want to do this. I hate taking tests. I never do well on tests." 2. Discuss the saying, "Whether you think you can or you think you can't, you're probably right!" 3. Discuss the "Ladder of Achievement." 4. Learners record their learning about attitude toward tests in journal.	discussion: a. What should an employee ask before taking a test? b. How can an employee prepare for the die setter test? c. What techniques or actions can help an employee prepare for a test? d. Can you change your attitude about taking tests? e. How can positive attitudes influence performance? f. How do athletes psych themselves up for a big game? 3. Where do you fit on the ladder of achievement when it comes to test taking?

V. Workplace Application: Learners will become familiar with positive attitudes toward test-taking so they can enhance their performance on job-related tests

VI. Evaluation/Comments:

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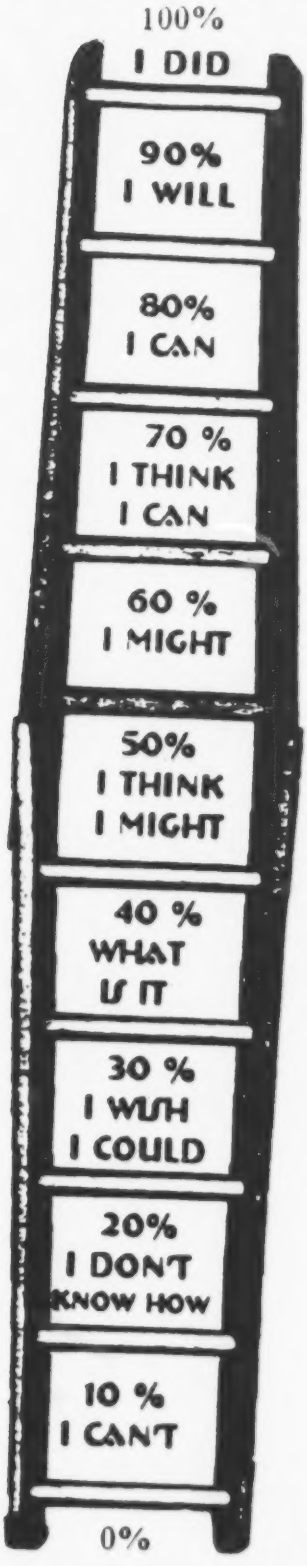
Ladder of Achievement



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Test Anxiety

I. Understanding /Outcome: Test anxiety can be managed.

Materials: "Test Anxiety" article, chalkboard, journals

III. Demonstration	
Activate prior knowledge. 1. Discuss the meaning of the word "anxiety."	1. When I say "anxiety" (write the word on board), what comes to your mind?
2. Discuss learners' experiences with anxiety.	2. Can you think of a time when you were anxious?
3. Discuss physiological reactions to anxiety and how they vary.	3. How does your body react when you are anxious?
4. Discuss "test anxiety," and how reactions can vary.	4. Think of a time you were nervous or anxious about taking a test. List reactions to test anxiety.
5. Have students suggest ways test anxiety can be managed.	5. Do you think it is possible to manage anxiety, especially when it comes to taking tests?

IV. Exercise/Engagement:	
1. Instructor chooses the most appropriate way to share information in the "Test Anxiety" hand out. Possible methods are: *Instructor reads aloud* *Jigsaw* *Say something* *Reciprocal questioning*	1.

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2. Discussion of article regarding article while teacher records on board. 3. Learners record most valuable suggestions in personal journal.	

V. Workplace Application: Preparing workers for job-related tests.

VI. Evaluation/Comments:

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Test Anxiety

Most of us worry a little during a test. Some people worry more than others. Psychologists who have studied these people describe them as *test anxious*. *Test anxiety* is the uneasy feeling some people feel because they must take a test. The physical symptoms of test anxiety may be different for different people. Some people may sweat excessively, others have stomach discomfort. Headache, rapid heart rate and shortness of breath have all been reported.

Those who study test anxiety say that it probably won't affect your test score. The best way to deal with it is to ignore it. The less attention you pay to test anxiety, the less you'll feel it and the faster you'll be able to answer the questions successfully on the test.

Test anxiety is different from excitement. It is normal to be excited when you take an important test. In fact, excitement can help you do your best on a test the same way it helps athletes do their best in competition.

Before the test

Since anxiety results from year, you can usually reduce test anxiety by preparing thoroughly for pests. If you are well prepared for a test, you will not have much to fear. Knowing good test taking techniques will help you reduce test anxiety.

It is important that you arrive at the test site on time and feeling well rested. Give yourself plenty of time to get to the test site to avoid rushing. You will not do your best if you're are tired. You can create more stress if you rush into the room at the last minute.

Taking tests seems much more difficult when there are long periods of time between tests. Practice reading passages and answering questions about what you read. Read as much as possible to get used to reading for a period of time. Take tests that are printed in newspapers and magazines, regardless of the topic. That will help you become more familiar with tests.

If possible, arrange to take practice tests under similar conditions before you take the actual test. Like anything else, practice helps to reduce nervousness during tests. If you will be taking a timed test, practice using a time limit.

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Tips to reduce test anxiety

If you are feeling very anxious, try doing this before you begin the test.

1. Take three slow, deep breaths. When you inhale say "Calm." When you exhale, say, "Down."
2. Imagine that the air you breathe is going all the way down to the soles of your feet.
3. Think positive thoughts like, "I have studied for this test and I know I can pass."
4. Look at the test in terms of the bigger picture of your life. Most tests are not life or death propositions. You can retake them.

As you begin to take the test

There are several things you can do to reduce test anxiety as you begin the test.

- When you get the test, look it over and find out what types of questions you must answer.
- Look to wee whether the questions are printed on both sides of the page.
- Make sure you know where to put your answers.
- Read the directions carefully and follow them exactly.
- Listen to everything the instructor says before and during the test.
- Plan your test-taking time so you will answer all the questions you know in case time runs out.
- Answer the easy questions first.
- Do not change answers unless you are very sure that your first response is wrong.

Remember, test taking is a skill that improves with practice. Preparation is the key to success!

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Optional Lessons

Locating Relevant Information

I. Understanding /Outcome:
To find and use information in reading materials to perform various tasks as needed.

Materials:
Davis Materials
Instructional aids: *Reading Skills that Work*, lessons 12 & 13.

III. Demonstration	
Activate prior knowledge.	Suggested activities.
Develop concept by recalling times when small pieces of information are needed at home or at work.	When you want to find: a special program on TV. a number in the phone book a part number in a catalog a certain article in the newspaper the starting time of a movie
Develop the context of when it is important to find relevant information in job-related materials.	Learners give examples of situation when it is necessary to locate information at work. Using the labor agreement to find policy in specific situation. (Sick leave, personal days. etc.)

IV. Exercise/Engagement:	
Understanding the format or organization of the material being used.	Use a variety of Davis materials to illustrate the many strategies for locating relevant information.
If applicable: Understanding time order Understanding alphabetical	Use operator guidelines Union contract Davis forms

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order Using the table of contents Using the index	
Note: Lesson will depend on the skills and needs of those in class to find relevant materials. Supplementary materials may be used.	

V. Workplace Application: This skill is necessary in the workplace to reduce time to find important information as well as test situations.

VI. Evaluation/Comments:

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Recognize, understand, and use technical vocabulary

I. Understanding /Outcome: Recognize, use, and understand technical vocabulary.

Materials: Davis materials, paper, pencils, dictionary

III. Demonstration	
Activate prior knowledge.	Suggested activities.
1. Develop concept of specific vocabulary for a subject.	1. Do you remember going to buy a house or a car for the first time, and hearing words that you did not understand? (Escrow, sticker price, invoice, balloon payment, etc.)
2. Brainstorm in pairs or groups, a list of words related to a topic.	2. Possible topics: Taxes funerals computers, hospitals, sports, unions, religions
3. Discuss the need for understanding the words in order to understand a topic.	3. Words have different meanings in different situations (contexts) Ex: slug
Note: This will be an opportunity to demonstrate how learning never stops. Being new to Davis, you will have little or know experience with Davis vocabulary and will be giving your students an opportunity to teach you their language.	

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IV. Exercise/Engagement:	
1. In pairs or a group, generate technical vocabulary that is necessary for a new Davis employee to understand daily operations. 2. Look at operator guidelines or labor agreement and find technical vocabulary. 3. Make of list of words and give definitions if possible.	1. Ask learners to recall when they were brand new on the job and the words that gave them trouble.

V. Workplace Application:
To recognize and understand technical vocabulary to be more able to read and use workplace materials.

VI. Evaluation/Comments:

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Skimming and Scanning

I. Understanding /Outcome: The learners will learn to skim and scan and understand the basic techniques and the appropriate uses.

Materials: Davis materials Supplementary materials: *Reading Skills that Work*, Lesson 14

III. Demonstration	
Activate prior knowledge. How does purpose determine action? Illustrate need for suiting action to purpose by discussing life situations at home and at work.	Suggested activities. How would you expect someone to drive if they were driving through a wildlife refuge looking for animals and birds? How would you expect someone to drive if they had an expectant mother in the care who was ready to deliver? How does one cook for a special holiday celebration compared to a busy night after work? How would things at work change depending on the situation?

IV. Exercise/Engagement:	
Ask learners to discuss the different ways they read based on their purpose for reading. Generate predictions of what	How do you read the Sunday paper? How do you read a favorite magazine? How do you read the directions to do something you have never done before? (Bake a cake, wire a light fixture.)

skimming and scanning techniques are in reading. Use Davis materials to illustrate the uses for skimming and scanning. Note: This lesson will depend on the skill levels of the learners and the relevance of their needs to skim and scan.	

V. Workplace Application:
To enhance techniques for reading workplace materials.

VI. Evaluation/Comments:

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Reading Meters and Gauges

I. Understanding /Outcome:
Read meters and gauges to obtain information.

Materials: Subject matter expert from class Accompanying supplemental materials: Worksheet with thermometers and gauges.

III. Demonstration	
Activate prior knowledge. 1. Brainstorm various kinds of meters and gauges found on the job - daily life. 2. List various kinds of information provided by meters and gauges.	Suggested activities. 1. Make 2 lists of types of meters and gauges. 2. Describe the various types of faces or numbering systems on the gauges.

IV. Exercise/Engagement:	
1. Display a cardboard thermometer(movable ribbon) 2. Determine the numbering system - for each line. 3. Discuss gauge thermometer worksheet.	1. Set ribbon at various temperatures 2. Determine how the numbers are spaced. 3. Determine the numerical value of the markings on the gauges. 4. Complete practice worksheet.

V. Workplace Application: Reading gauges or meters for specific numerical information.

VI. Evaluation/Comments:

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Writing: Completing forms

I. Understanding /Outcome:
To develop skill in completing workplace forms that are accurate and legible.

Materials: Medical form, vacation form, etc.

III. Demonstration	
Activate prior knowledge. 1. Discuss the important of forms in work life and personal life. 2. Present samples of forms that are legible and illegible. Compare and contrast the forms. 3. Discuss *WHO* reads the forms. (Who is the audience?)	Suggested activities. 1. "When do you have to fill out forms?" Instructor should list responses. 2. Why is it important to fill out forms correctly? Brainstorm importance of correctly completed forms. 3. What happens when forms are not legible, accurately filled out, or complete? 4. What makes a form legible? 5. What are the important steps in filling out forms?

IV. Exercise/Engagement:	
1. Provide a variety of forms for learner to complete. 2. Learner decided what information is needed to complete form. 3. Make suggestions to	1. Using suggestions from class, provide samples of forms for students to complete. 2. Compare completed forms.

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improve legibility. 4. Identify abbreviations and discuss their meanings. 5. Discuss the variety of ways to report information. (Date: 6/2/95, June 2, 1995, 06/02/95.)	

V. Workplace Application: Apply the skills learned to accurately complete forms on the job or as needed in other life situations.

VI. Evaluation/Comments:

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Reading Micrometers

I. Understanding /Outcome: To understand the function and numerical readings for micrometers.

Materials: Find an expert from the plant who can bring in micrometers and demonstrate and explain using a micrometer giving learners hands on experience. If no expert is available, we recommend "Using a micrometer" *Automotive Trades*, T. Sticht.

III. Demonstration	
Activate prior knowledge. 1. Raise the concept of "what is a micrometer?" and how .t differs from other measuring tools.	Suggested activities. 1. Have you ever seen or used a micrometer? 2. What does the word MICROMETER make you think about? 3. When are they used in the plant. 4. Solicit experts from class or plant.

IV. Exercise/Engagement:	
1. Develop skills for reading and measuring with a micrometer. 2. Discuss the uses of a micrometer at work.	1. Develop the concepts on worksheets following activities and directions on worksheets. 2. Use the plant expert to demonstrate using the micrometer. 3. Practice using the micrometer by measuring a variety of specimens.

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V. Workplace Application:
Skill needed for passing some apprenticeship tests.

VI. Evaluation/Comments:

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I. Understanding /Outcome:

Materials:

III. Demonstration	
Activate prior knowledge.	Suggested activities.

IV. Exercise/Engagement:	
1.	1.

V. Workplace Application:

VI. Evaluation/Comments:

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Glossary for Apprenticeship Prep

abbreviation - a short way of writing something. The abbreviation for Quality Control is QC.

abstract reasoning - tests on *abstract reasoning* are designed to measure how well one can reason with figures or designs.

adapt - to adjust to a particular use or situation.

analogies - Analogies are used to measure reasoning with words. If two words are known to be related in one way, two other words are chosen to be related in the same way. Example - *Cow* is to *calf* as *dog* is to *puppy*.

antonym - a word having the opposite meaning of another word. Ex. *Good* is an antonym for *bad*..

anxiety - uneasiness, intense fear, dread

appropriate - suitable or fitting

attitude - a state of mind or feeling

audience - the person or people who listen to you speak or read what you write.

average - the average of a set of numbers is found by adding a set numbers together and dividing by the amount of numbers that make up the sum. Example - 12 + 14 + 15 + 19 = 60 60 - - 4 = 15

axes - the plural of *axis*, more than one axis

axis -- the line on a graph, there are usually 2 axes, one horizontal (left to right) and one vertical (up and down)

bar graph -- a graph that uses bars (stripes or bands) to picture the relationships among numbers. Bar graphs show data based on a vertical axis

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and a horizontal axis in the form of bars. They are very good for comparing information.
basic operations

basic math signs and operations -

- \+ addition or positive number
- \- subtraction or negative number
- x multiplication or unknown number
- / division
- - - division
- > greater than
- < less than

canceling- a shortcut when multiplying fractions. It means dividing a top and a bottom number by a figure that goes evenly into both before actually multiplying. It is not necessary to cancel to get the right answer, but it makes multiplying easier.

chart -- a graphic representation of data that lists exact numbers in columns and rows

column -- a group of numbers or words that are listed vertically, (up and down) in a table or chart

common denominator

compare -- to look at two or more numbers and see their similarities and differences; also to decide which is larger or smaller.

convert - change one thing to another. Example - *convert* a fraction to a decimal means to change a fraction to a decimal

compare -- to look at two or more numbers and see their similarities and differences, also to decide which is larger or smaller.

convert -- to change one thing to another. Sometimes it's necessary to convert meters to yards.

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decimal - a number with a decimal point in it.

decimal point - a dot written in a series of numbers that has the places of whole numbers to the left of it and decimal places to the right of it.

denominator - the bottom number of a fraction, it wills how many parts are in the whole

digit - any of the number symbols from 0-9.

dimensions -- the length, width, and/or depth of an object. The dimensions of the sheet of steel were: length, 10 feet; width, 5 feet

directional effect - the effect of a force on an object due to the direction it comes from. Example-- The flow of water in a stream has a directional effect on the plants growing in the water.

divisible number - a number that can be evenly divided by another number.

equal - being the same or identical to in value

fraction -- a part of a whole, a number less than one but greater than zero

Ex $\frac{1}{4}$

graphs - a picture or map of numbers, tools for displaying data. There are many different kinds of graphs including bar graphs, line graphs, and pie charts or circle graphs.

higher terms - to change a fraction to larger numbers so you can continue with adding, subtracting, multiplying and dividing. $\frac{1}{5}$ can be raised to $\frac{2}{10}$ or $\frac{20}{100}$

improper fraction - the top number is *equal to or larger than* the bottom number

intersect -- to meet and cross at a point, in a chart or table

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introduction - to provide the first knowledge or first experience with something or someone.

invert - means to turn a fraction upside down. $\frac{7}{10}$ can be inverted to $\frac{10}{7}$

legible - handwriting that is easy to read.

lowest terms - to change a fraction to the lowest numbers possible. $\frac{2}{8}$ can be reduced to the lowest terms of $\frac{1}{4}$

math operations - are addition, subtraction, multiplication, and division

mean - the average of a set of numbers, calculated by adding a set numbers together and dividing by the number of sets in the sum. Ex. 12 + 14 + 15 + 19 = 60 60 - -4 = 15

mechanical reasoning - in test situations, mechanical reasoning is measured by showing pictures of objects or machine parts with arrows showing directions of force and asking for interpretations of the results.

metric system -- a system of measurement based on tens, used by most people outside the Untied States. Unites such as centimeters, millimeters, grams, and kilograms are used in the metric system

minus sign (-) - The sign for subtraction or a negative number

mixed numbers - a whole number written next to a proper fraction, $3\frac{1}{3}$ To perform math operations to some mixed numbers, they must be changed to improper fractions.

$3\frac{1}{3}$ is changed to $\frac{10}{3}$.

multiplication sign (x) - the sign for multiplication.

negative number - a number less than zero

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numerator - the upper number of a fractions, it tells how many parts you have

order of operations - the sequence in which math operations must be done to get a correct answer.

place value - the value of a number that is related to its position from the decimal point.

positive number - a number that has a value of more than zero

proper fraction the top number is less than the bottom number -- $\frac{1}{3}$

plus sign (+) - the sign for addition or a positive number

positive number - a number greater than zero

reduce (a fraction) - means writing it with smaller numbers. $\frac{25}{100}$ can be reduced to $\frac{1}{4}$

relationship -- a connection between people or things. Graphs and charts show the relationships of numbers

relevant - related to the matter at hand.

rounding off -

scan - to look over a piece of writing to find a particular piece of information. Example --Looking in the movie guide to find the time a certain movie starts at a certain show.

skim - to look over a piece of writing to get a general understanding of its content by reading subtitles or first sentences of paragraphs.

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space relation - in test situations, space relations is measured by showing a one dimensional pattern and giving several choices how it would look if folded into a three dimensional object.

table -- a graphic representation of data that lists exact numbers in columns and rows

technology -- Machines and ways of doing things that improve the speed and/or quality of work. The use of computers in manufacturing is an example of modern technology

test anxiety - the uneasiness some people feel because the take a test.

U. S. customary units -- the way people in the United States usually measure, using units such as inches, feet, miles, ounces, and pounds. In many industries, U. S. customary units are being replaced by the metric system.

vocabulary - the words that are important and/or have special meaning to a topic. Topics like *real estate* or *truck driving* have their own common words or vocabulary

whole numbers - the numbers most commonly used in counting (0, 1, 2, 3, 4, ...)

width -- the distance from one side to another of something. In rectangles, the shorter dimension. The length of the rectangle was 50 centimeters, the width was 20 centimeter

x - the sign for multiplication. Can also stand for an unknown number.

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